Human Computer Interaction
CS449 – CS549

Week 3-1

What is a good user interface
Laws in HCI: Fitt's Law
Affective Computing

Guidelines, Styles, and Evidence

KÜRŞAT ÇAĞILTAY

Today – Foundational Concepts

- Fitt's law (2nd. Assignment)
- Experiments on Interface Designs - Affect

Assignment-1: Design Diary

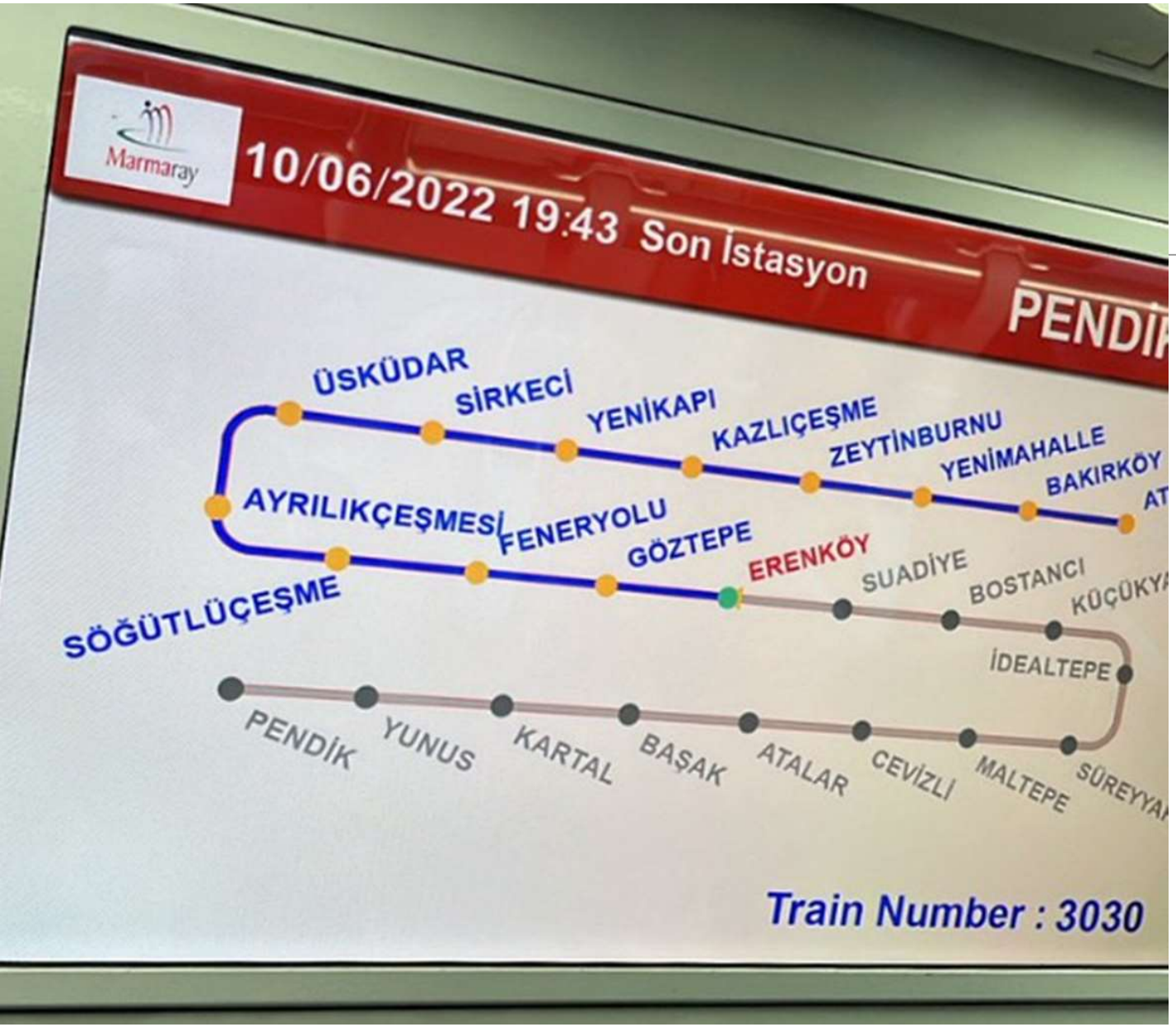
- Short (2-4 pages) analyses of a user issue with any interactive technology - mobile, desktop or others
- Describe problem, analyze it in HCI terms, support your arguments with HCI literature (Mainly by Norman and Shneiderman)
- Recommend re-design option(s) with Figma RP

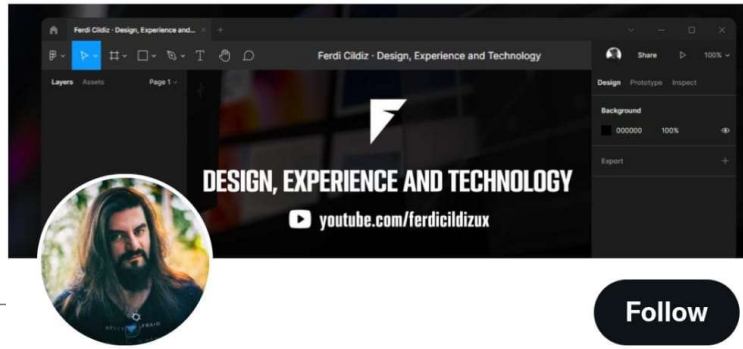
Design Diary Report Evaluation

- Relevance – is it an HCI design issue?
- Description – can the reader foresee the issue clearly?
- Theory – how does this issue relate to the literature on HCI?
- Recommendation – how might the issue be resolved?

- Use Shneiderman, Norman, other resources for each heading.
  - E.g. Is it evaluation or execution problem? Does it violate Shneiderman's Eight Golden Rules? Does it violate Norman's Principles of Good Design

Design Problem of Marmaray Stops





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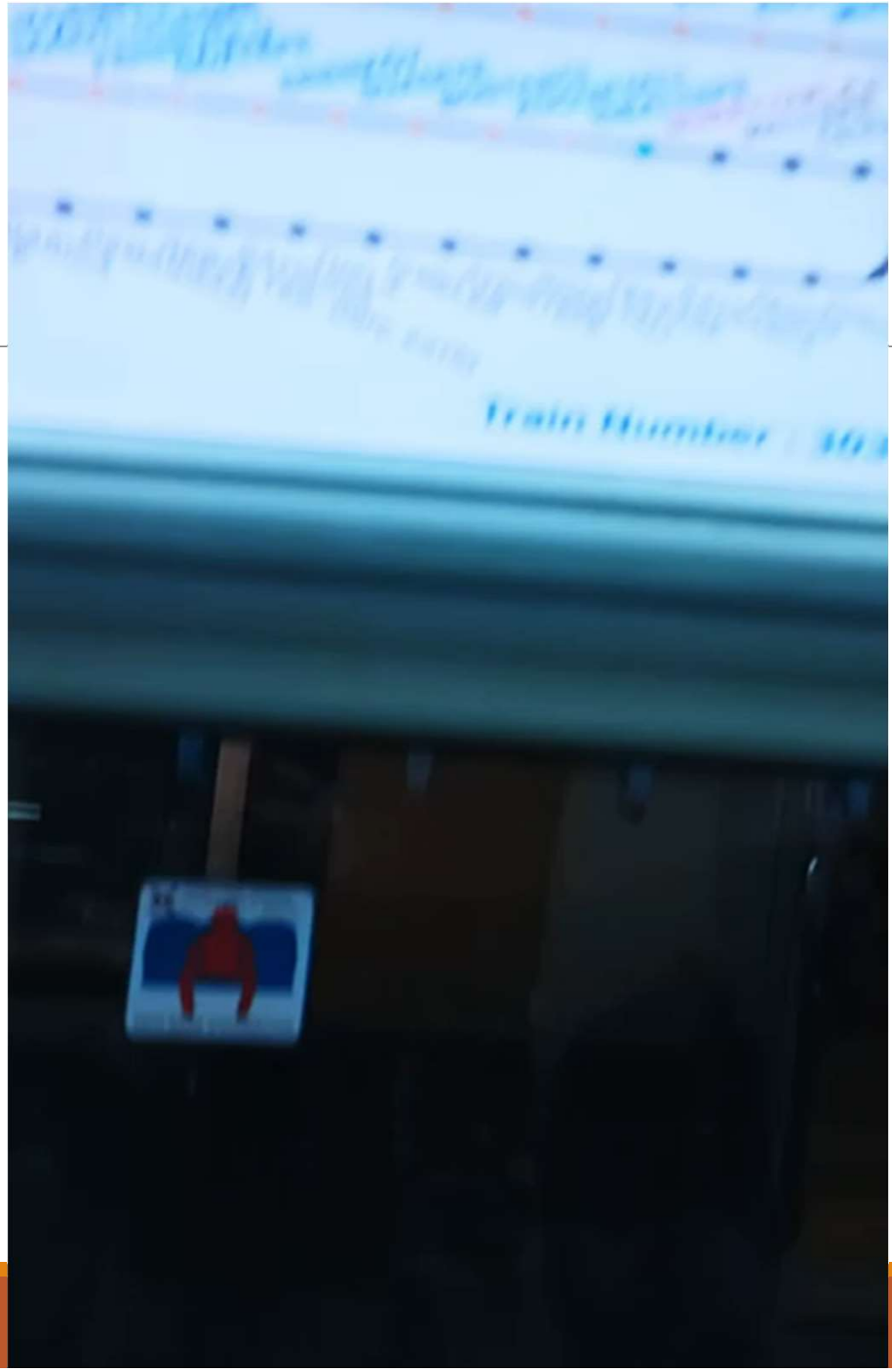
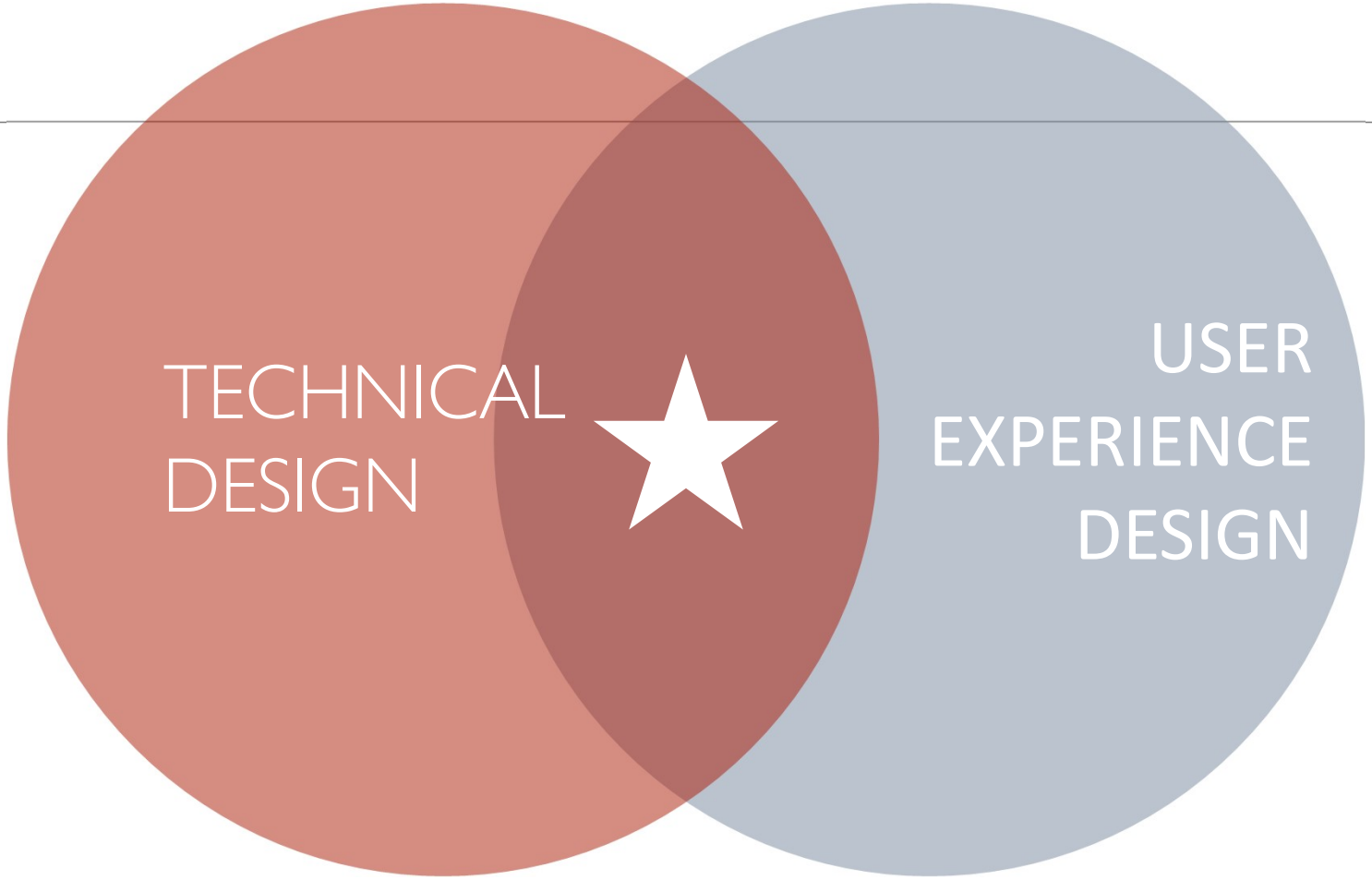
Marmaray'daki durak karmaşasından bunalan genç, bilgisayarda tasarladığı yeni durak sistemini internete yükledi. Ulaştırma Bakanlığı'na seslenip "Teşekküre gerek yok" ifadelerini kullandı.


Train Number


TECHNICAL
DESIGN
USER
EXPERIENCE
DESIGN

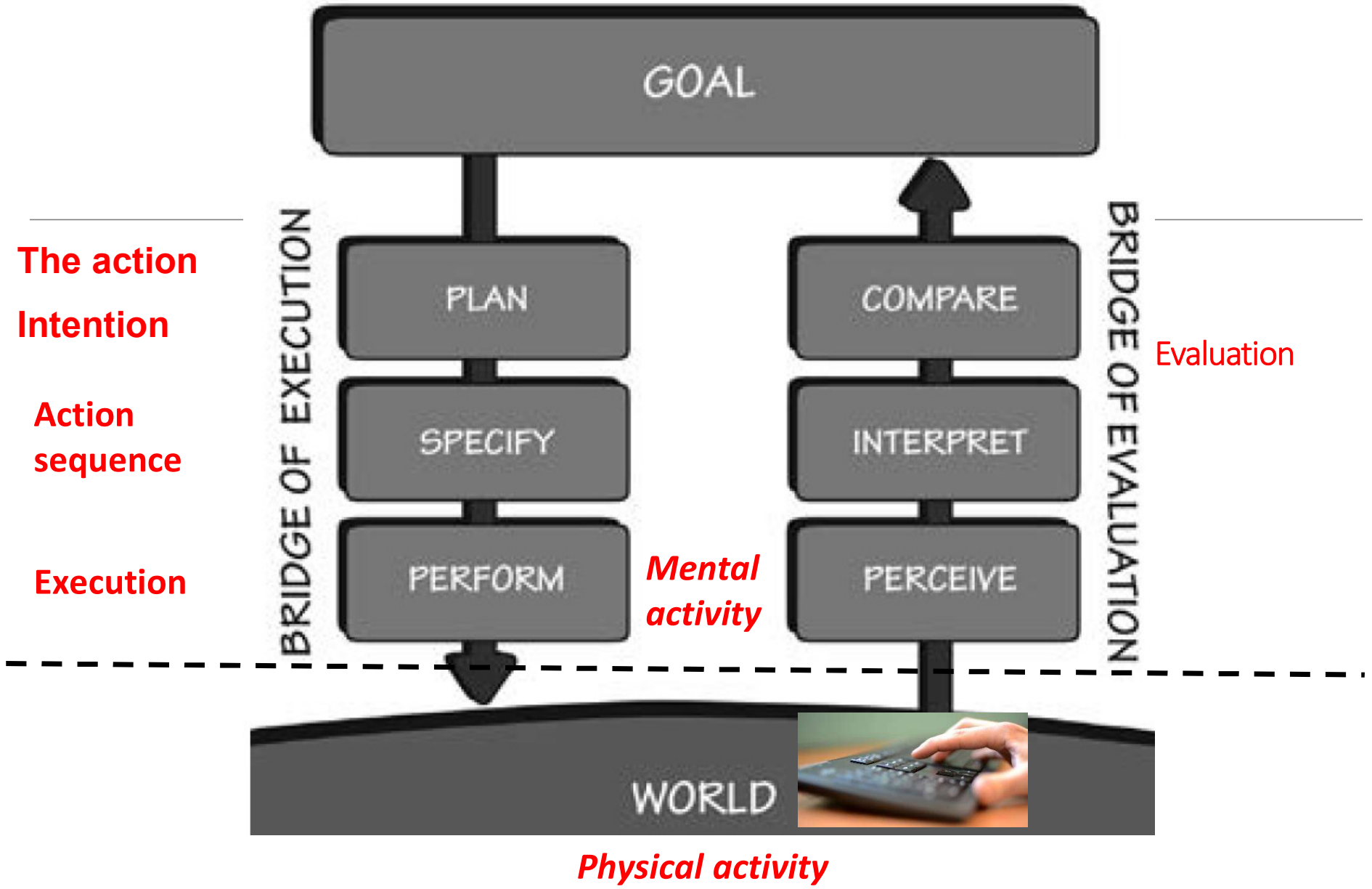
Four Principle components of an HCI System

Tool

In Context

User

Task/Goal



Seven stages of user activities involved in task performance

Shneiderman's Eight Golden Rules of Interface Design

1. Strive for consistency. ...
2. Seek universal usability. ...
3. Offer informative feedback. ...
4. Design dialogs to yield closure. ...
5. Prevent errors. ...
6. Permit easy reversal of actions. ...
7. Keep users in control. ...
8. Reduce short-term memory load.

Norman's Principles of Good Design

1. **Discoverability** - State and action alternatives should be **Visible**
2. A **good conceptual model** with a consistent system image
3. **Good mappings** for the relationship between stages
4. Continuous **Feedback**
5. **Affordances –** possible interactions between people and the environment
6. **Signifiers –** what actions are possible and how
7. **Constraints -** physical, logical, semantic, and cultural

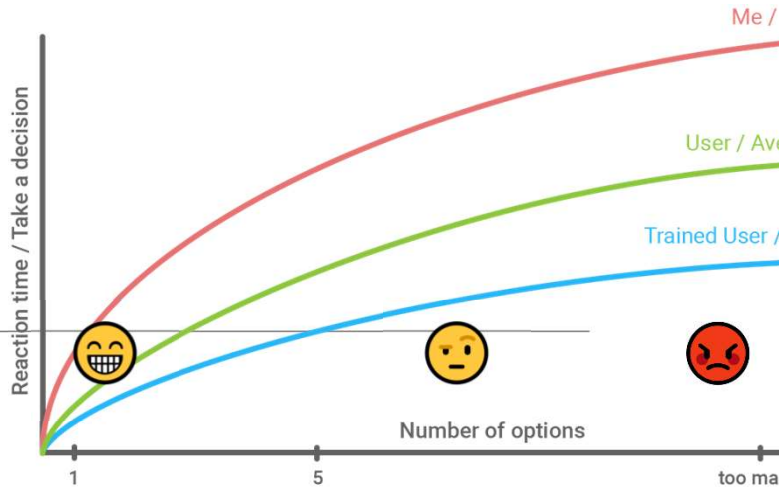
Usability of interactive systems:

Ben Shneiderman. Ch-3 Guidelines, Principles, Theories

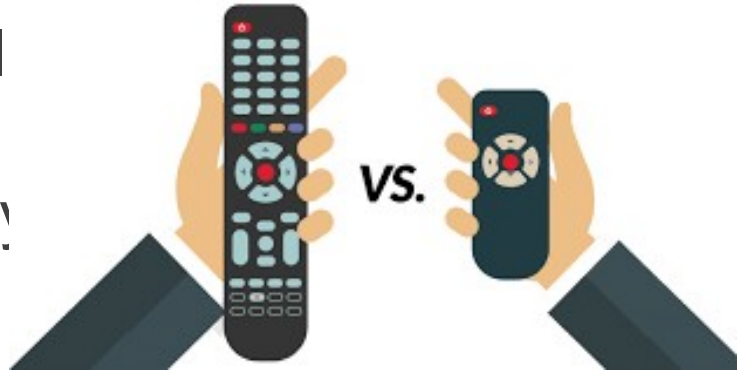
1. Style Guidelines,
   - Low-level focused advice about good practices
2. Principles,
   - Middle-level strategies, rules or laws to analyze and compare design alternatives
3. Theories
   - High-level widely applicable frameworks

Some Laws of HCI

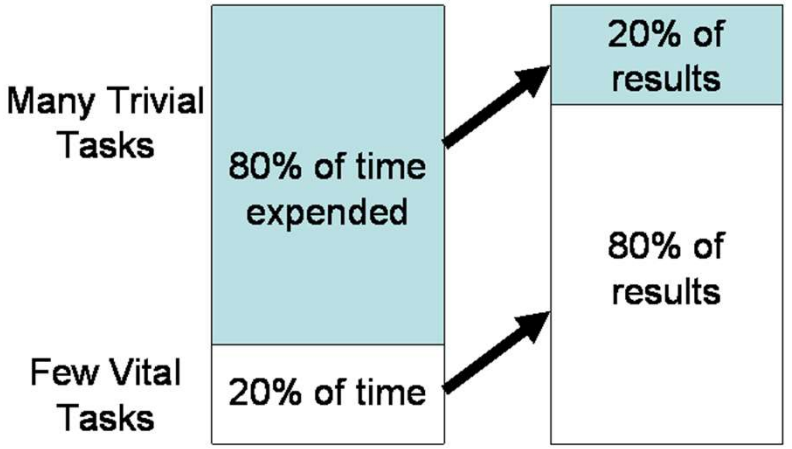
(based on empirical observations and research)



- **Hick's Law**
  - the time it takes for a person to make a decision increases logarithmically with the number of choices.
- Reaction time T=b*log 2 (n+1)
- b = Constant (time to process each option)
  n=Number of choices
- Implications in HCI: Keep options simple and wel organized to minimize user decision time.
- Use progressive disclosure to manage complexit showing more details only when needed.



Pareto Principle (80/20 Rule)



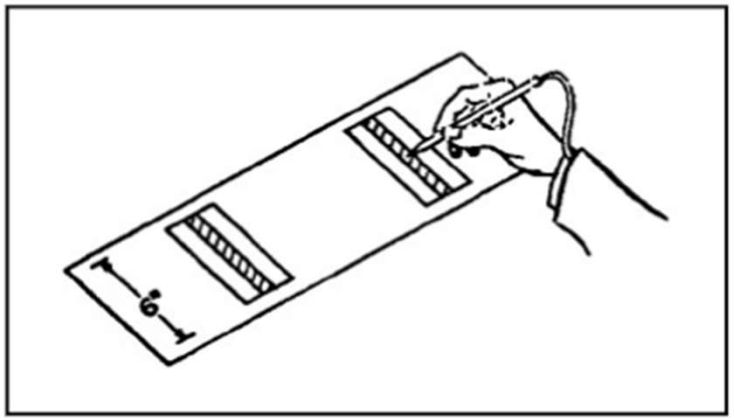
- This principle suggests that 80% of the effects come from 20% of the causes.
- In terms of HCI : 80% of users use 20% of features.
  - E.g. 20% of your apps, 80% of your phone time or 15% of tasks used by 90% of users
- Implications in HCI:
  - Focus on optimizing the key 20% of features that most users rely on.
  - Simplify interfaces by reducing unnecessary complexity.

Miller's Law & Gestalt Principles

- **Miller's Law :**
  - Average human can only hold about 7 ± 2 items in working memory at any given time.
  - Implications in HCI : Limit the number of items in menus or options to about 5-9. Use chunking to break down information into more digestible units.
- **Gestalt Principles:**
  - describe how humans group similar elements, recognize patterns and simplify complex images when we perceive objects.
  - Implications in HCI : Group related items together in a UI

Interaction at Low Level: Fitts' Law

- 1954, psychologist Paul Fitts
- model of human movement
- time required to move to a target depends on the distance to it yet relates inversely to its size.
- fast movements and small targets result in greater error rates
- Time and Error

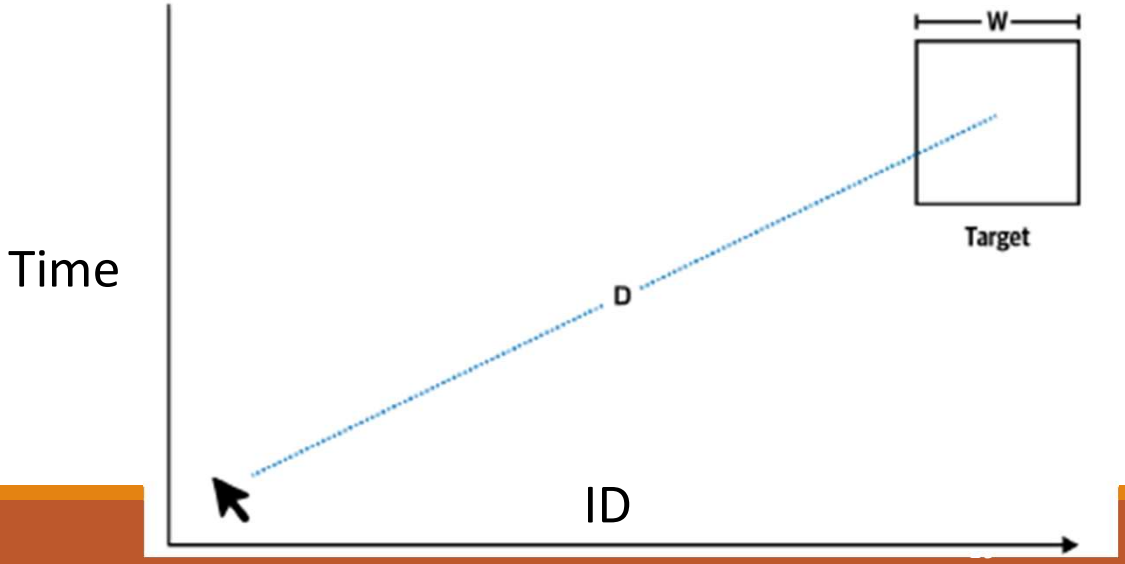


Reciprocal Tapping Apparatus

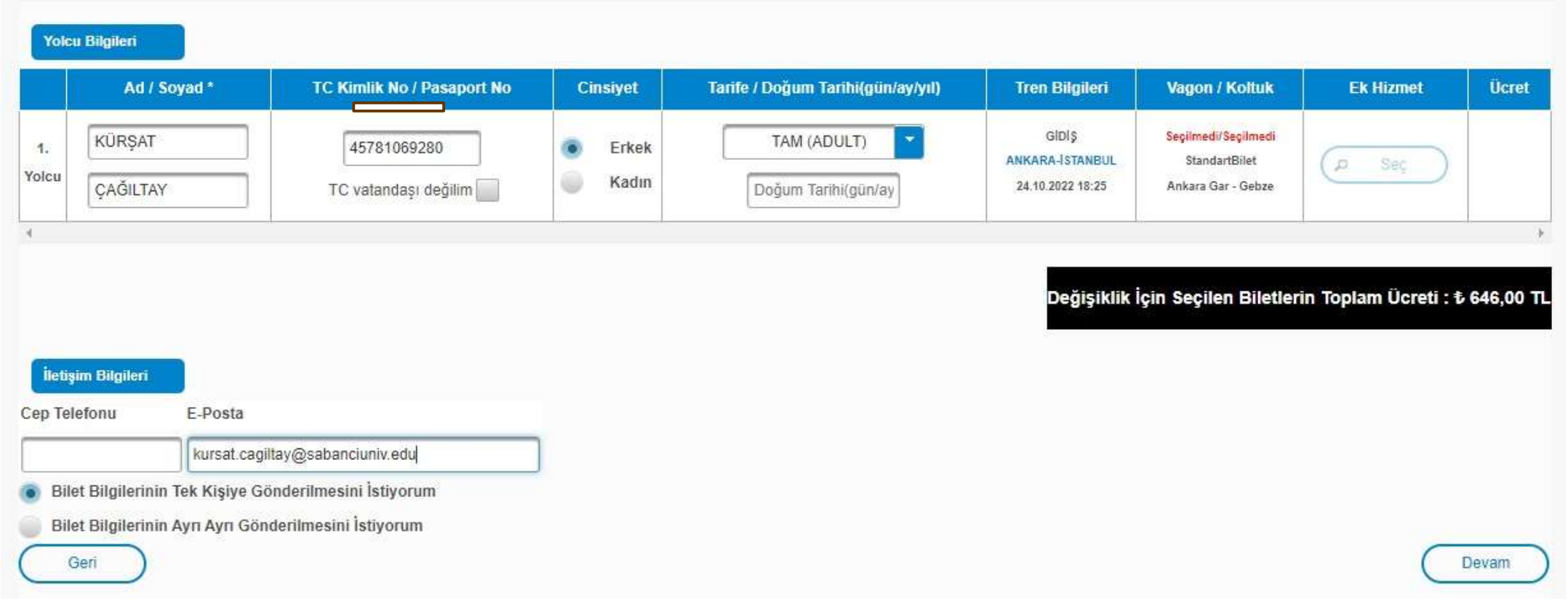
Fitts's Law (2nd assignment)

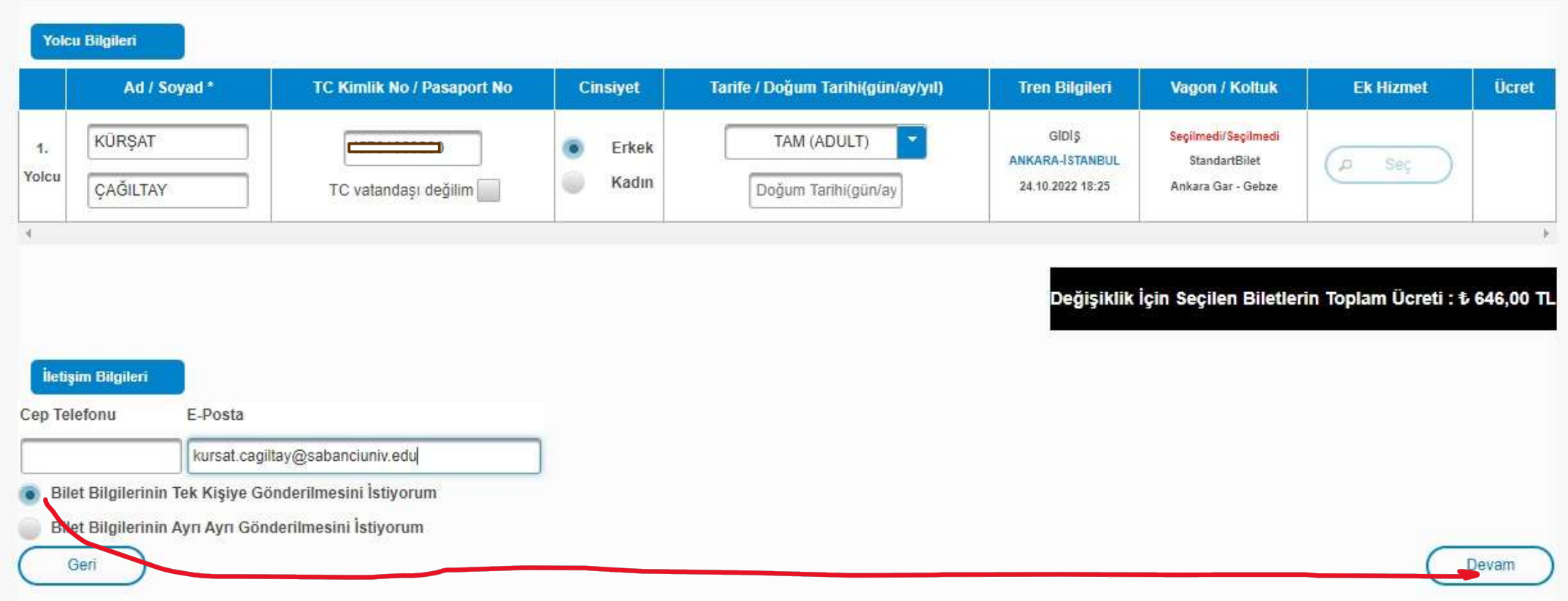
- Movement task's difficulty is a function of distance to move (D) and width of target (W):
- Index of Difficulty (ID) = Log_2 (2D / W)
- Movement time (MT) is derived from ID for given data sample

- MT = a + b Log_2 (2D / W)
- a and b constants for device

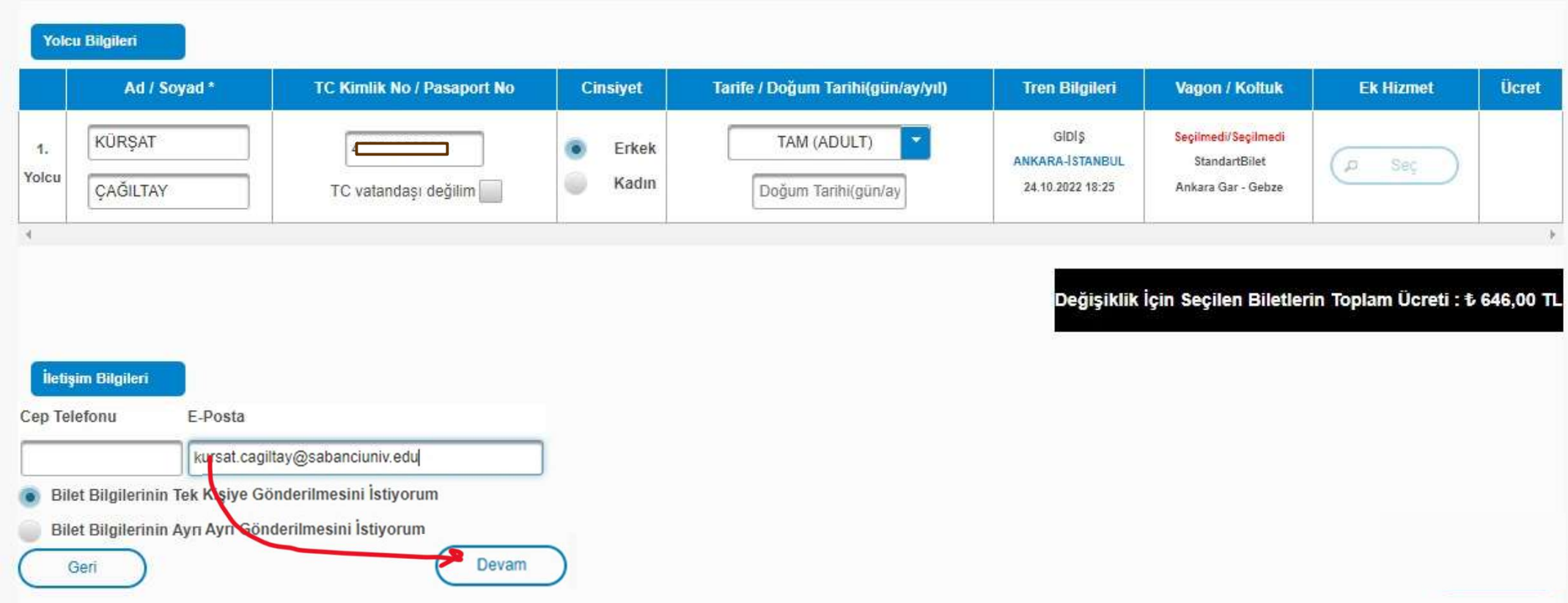


TCDD Train Ticket App (Old one)
ebilet.tcddtasimacilik.gov.tr

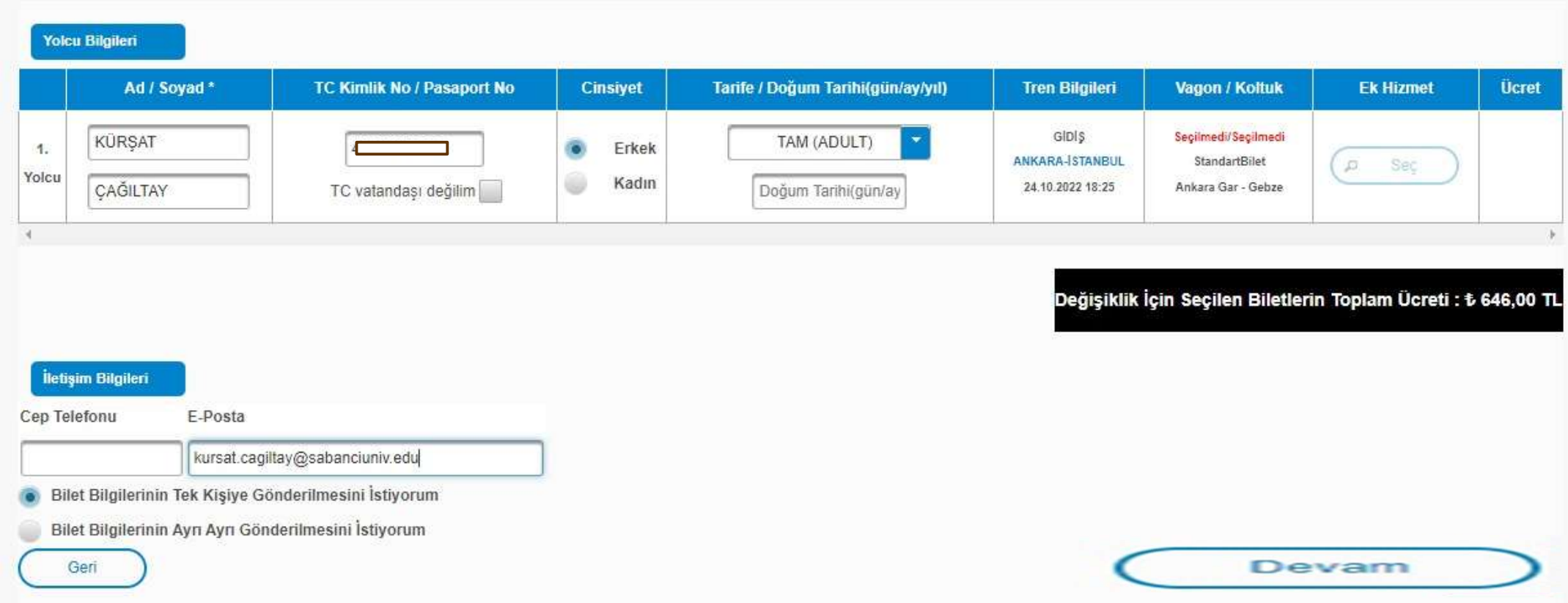




- ID for «Devam» button task?
- D= 22 cm
- W= 2.5 cm
- ID= Log_2 (2*22/2.5) = Log_2 (17.6) =4.13

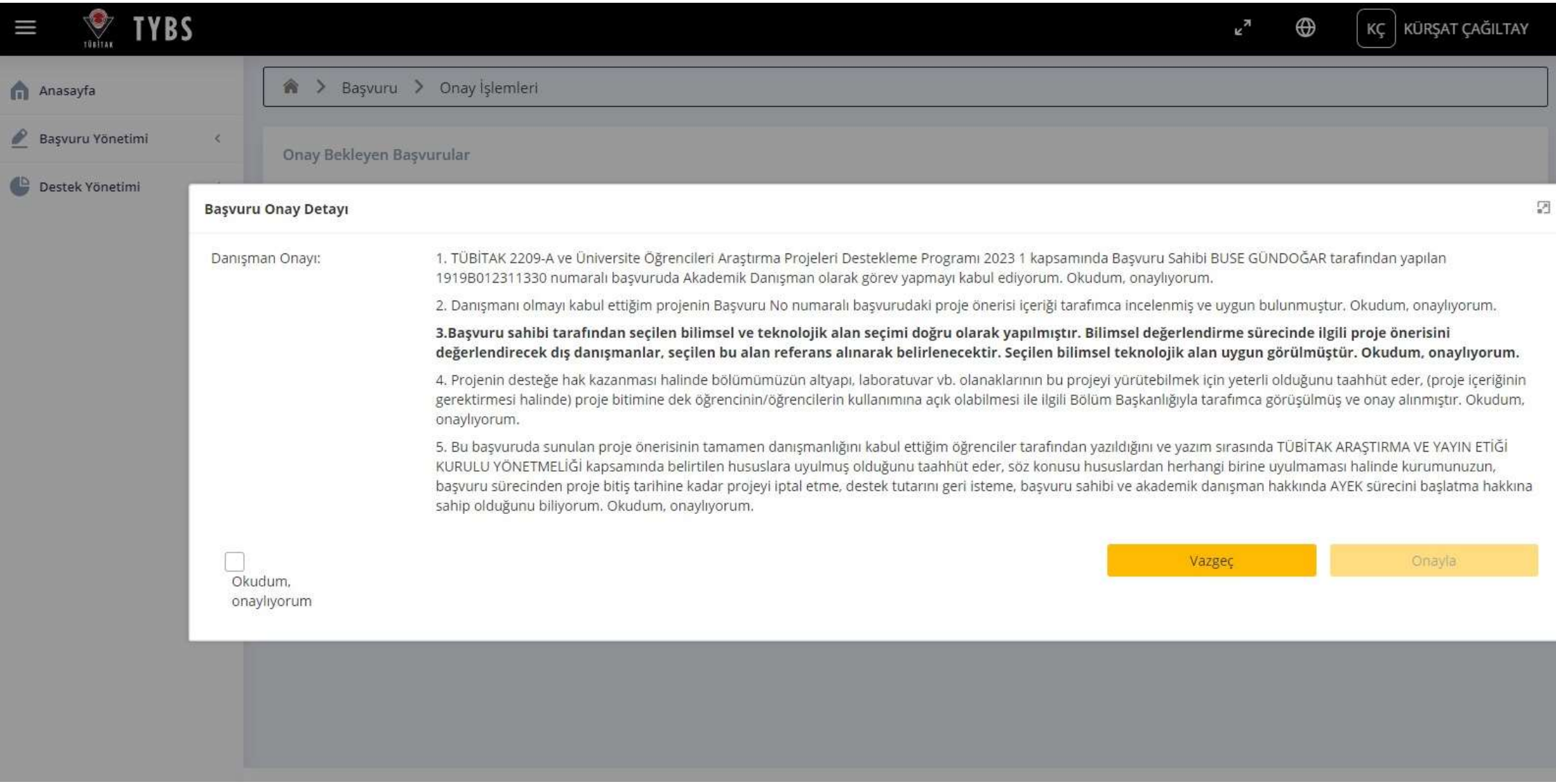


- ID for «Devam» button?
- D= 3 cm
- W= 2.5 cm
- ID= Log_2 (2*3/2.5) = Log_2 (2.4) =1.26



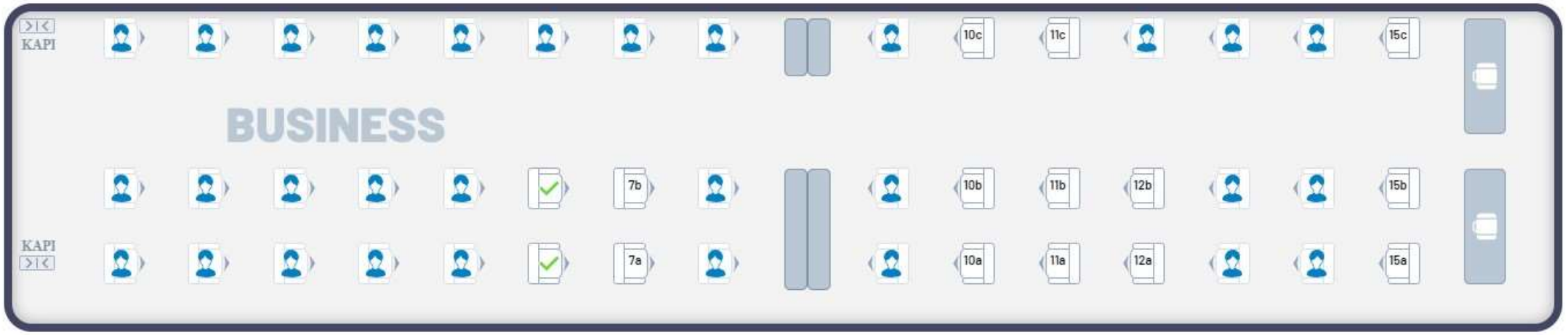
- What if I increase the size of the button?
- D= 22 cm
- W= 5 cm
- ID= Log_2 (2*22/5) = Log_2 (8.8) =3.13

- Down from 4.13 to 3.13
- Aesthetics?


TYBS
KÇ KÜRŞAT ÇAĞILTAY
Anasayfa
Başvuru Yönetimi
Destek Yönetimi
Başvuru > Onay İşlemleri
Onay Bekleyen Başvurular
Başvuru Onay Detayı
Danışman Onayı:
1. TÜBİTAK 2209-A ve Üniversite Öğrencileri Araştırma Projeleri Destekleme Programı 2023 1 kapsamında Başvuru Sahibi BUSE GÜNDOĞAR tarafından yapılan 1919B012311330 numaralı başvuruda Akademik Danışman olarak görev yapmayı kabul ediyorum. Okudum, onaylıyorum.
2. Danışmanı olmayı kabul ettiğim projenin Başvuru No numaralı başvurudaki proje önerisi içeriği tarafımca incelenmiş ve uygun bulunmuştur. Okudum, onaylıyorum.
3.Başvuru sahibi tarafından seçilen bilimsel ve teknolojik alan seçimi doğru olarak yapılmıştır. Bilimsel değerlendirme sürecinde ilgili proje önerisini değerlendirecek dış danışmanlar, seçilen bu alan referans alınarak belirlenecektir. Seçilen bilimsel teknolojik alan uygun görülmüştür. Okudum, onaylıyorum.
4. Projenin desteğe hak kazanması halinde bölümümüzün altyapı, laboratuvar vb. olanaklarının bu projeyi yürütebilmek için yeterli olduğunu taahhüt eder, (proje içeriğinin gerektirmesi halinde) proje bitimine dek öğrencinin/öğrencilerin kullanımına açık olabilmesi ile ilgili Bölüm Başkanlığıyla tarafımca görüşülmüş ve onay alınmıştır. Okudum, onaylıyorum.
5. Bu başvuruda sunulan proje önerisinin tamamen danışmanlığını kabul ettiğim öğrenciler tarafından yazıldığını ve yazım sırasında TÜBİTAK ARAŞTIRMA VE YAYIN ETİĞİ KURULU YÖNETMELİĞİ kapsamında belirtilen hususlara uyulmuş olduğunu taahhüt eder, söz konusu hususlardan herhangi birine uyulmaması halinde kurumunuzun, başvuru sürecinden proje bitiş tarihine kadar projeyi iptal etme, destek tutarını geri isteme, başvuru sahibi ve akademik danışman hakkında AYEK sürecini başlatma hakkına sahip olduğunu biliyorum. Okudum, onaylıyorum.
Okudum, onaylıyorum
Vazgeç
Onayla

Lütfen koltuk seçimini tamamlayınız.

2+1 Pulman (Business) 45



⚠ Engelli koltuk yerlerinde sadece tekerlekli sandalyeli yolcularımız seyahat edebilir. Bu kısımlarda koltuk yoktur.

⚠ Business vagonlarda 325 km ve üstündeki seferlerde özel ikram servisi bulunmaktadır.

Seçili Koltuklar

Seçtiğiniz koltuklar aşağıda listelenmektedir.

YHT: İSTANBUL-ANKARA

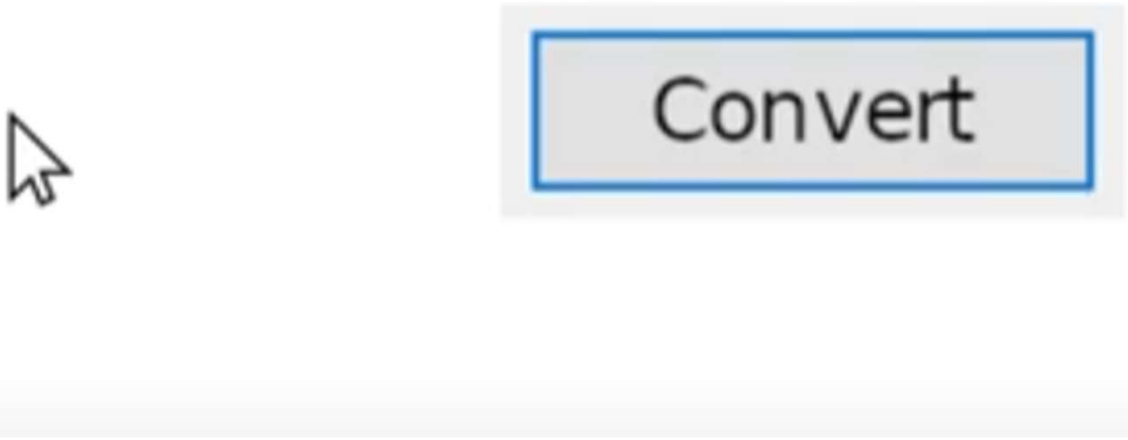
1.Yolcu (Erkek) — Değiştir

Vagon:1 — Standart Koltuk: **6b**

2.Yolcu (Erkek) — Değiştir

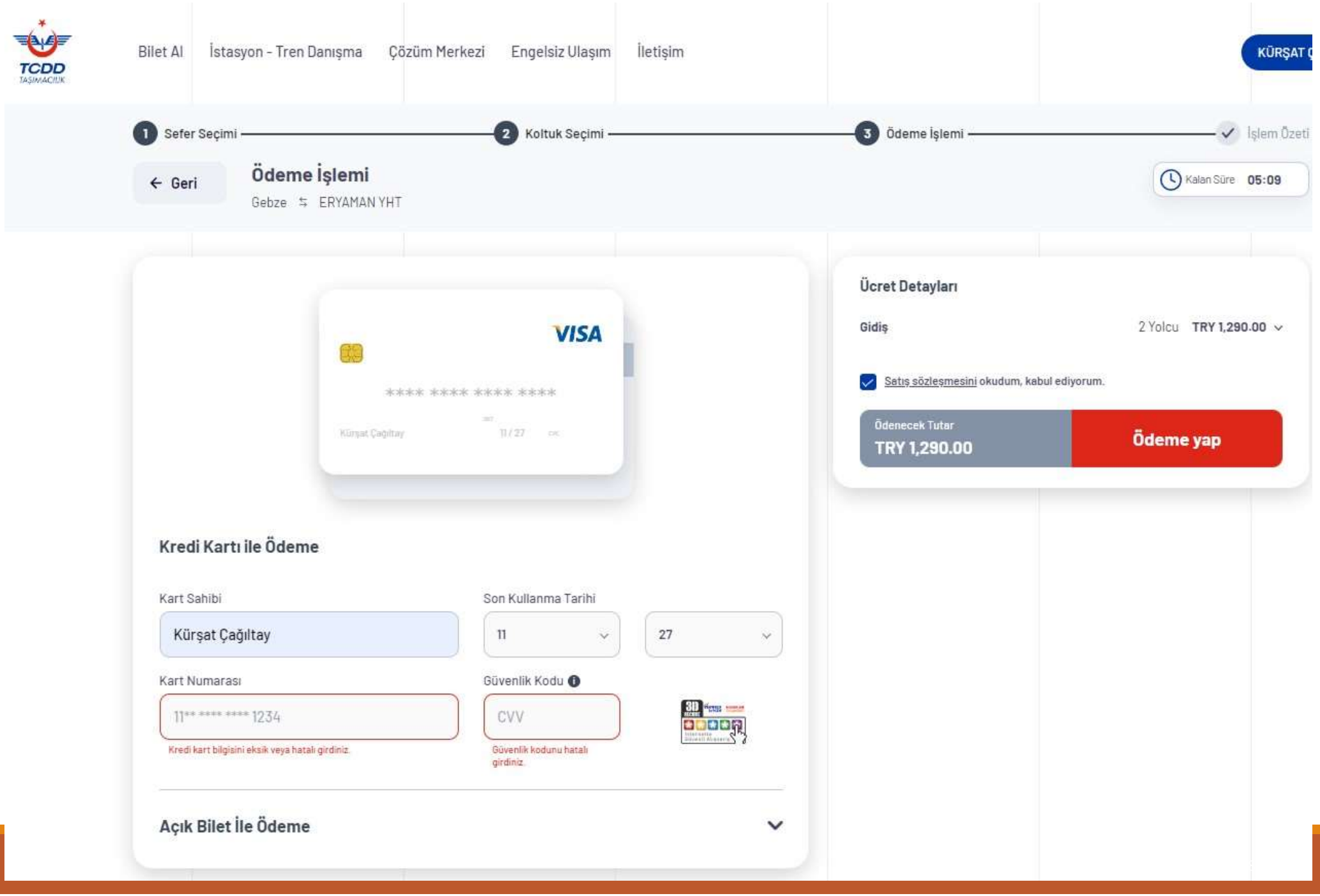
Vagon:1 — Standart Koltuk: **6a**

Seçimi Tamamla

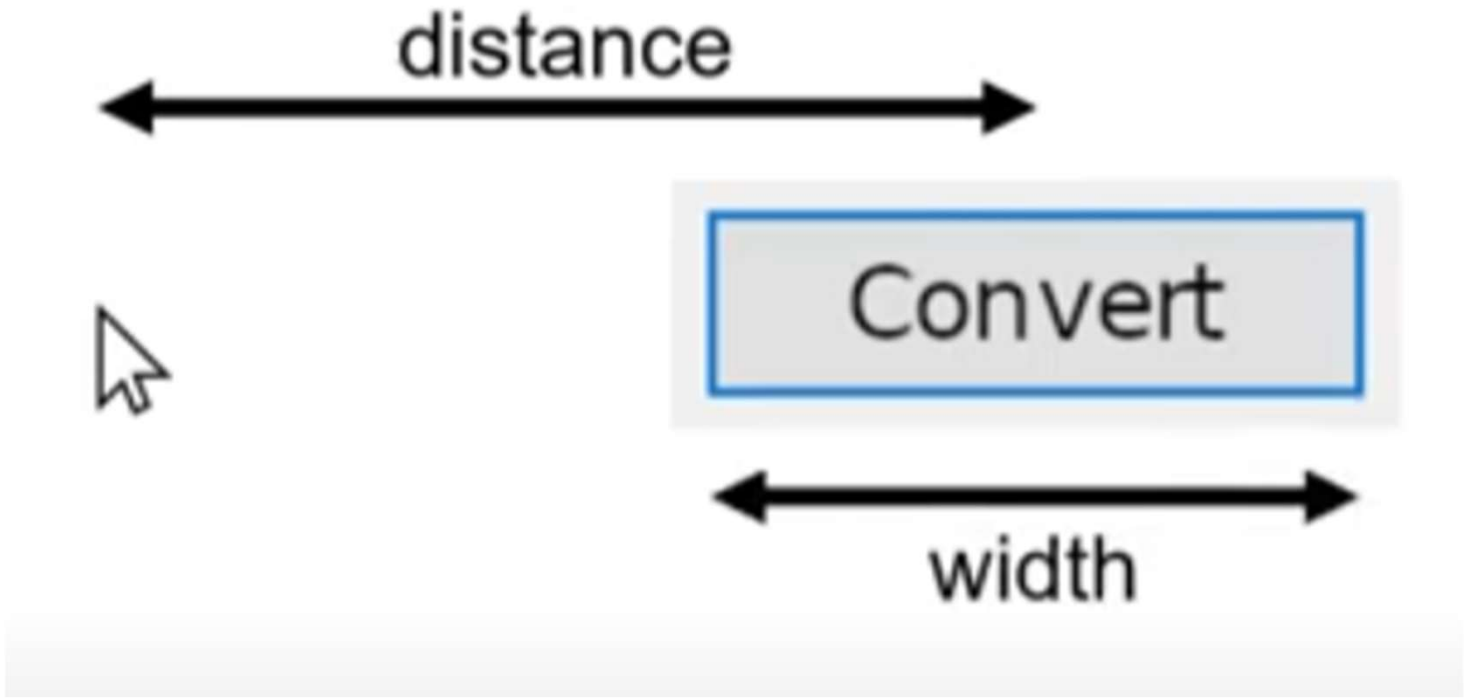

Convert

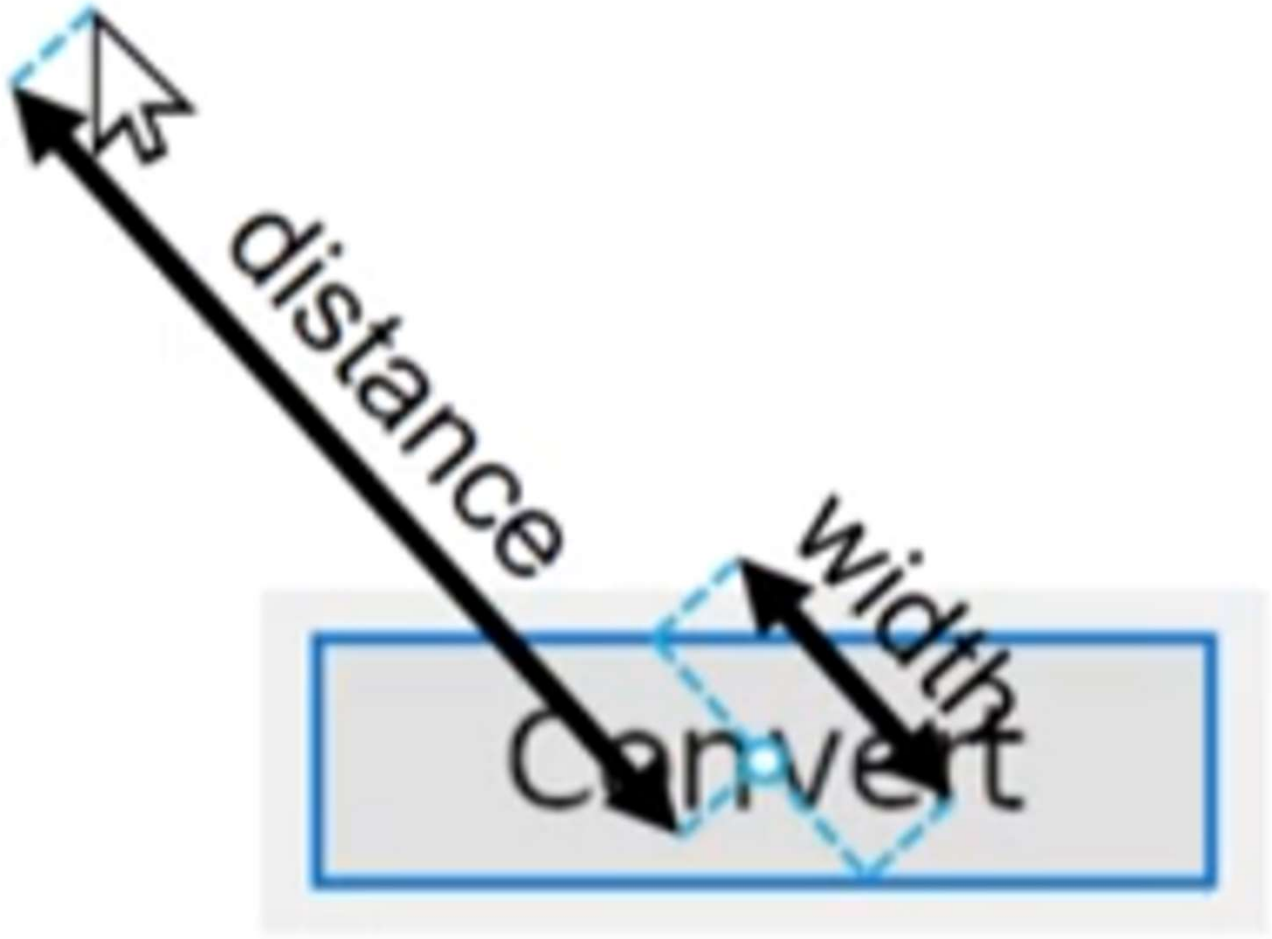
Low ID, but is it OK?

Sometimes OK


TCDD TAŞIMACILIK
Bilet Al
İstasyon - Tren Danışma
Çözüm Merkezi
Engelsiz Ulaşım
İletişim
KÜRŞAT Ç
1 Sefer Seçimi
2 Koltuk Seçimi
3 Ödeme İşlemi
İşlem Özeti
← Geri
Ödeme İşlemi
Gebze ⇆ ERYAMAN YHT
Kalan Süre 05:09
VISA
**** **** **** ****
Kürşat Çağıltay
11 / 27
Kredi Kartı ile Ödeme
Kart Sahibi
Kürşat Çağıltay
Son Kullanma Tarihi
11
27
Kart Numarası
11** **** **** 1234
Kredi kart bilgisini eksik veya hatalı girdiniz.
Güvenlik Kodu
CVV
Güvenlik kodunu hatalı girdiniz.
Açık Bilet İle Ödeme
Ücret Detayları
Gidiş
2 Yolcu TRY 1,290.00
Satış sözleşmesini okudum, kabul ediyorum.
Ödenecek Tutar
TRY 1,290.00
Ödeme yap

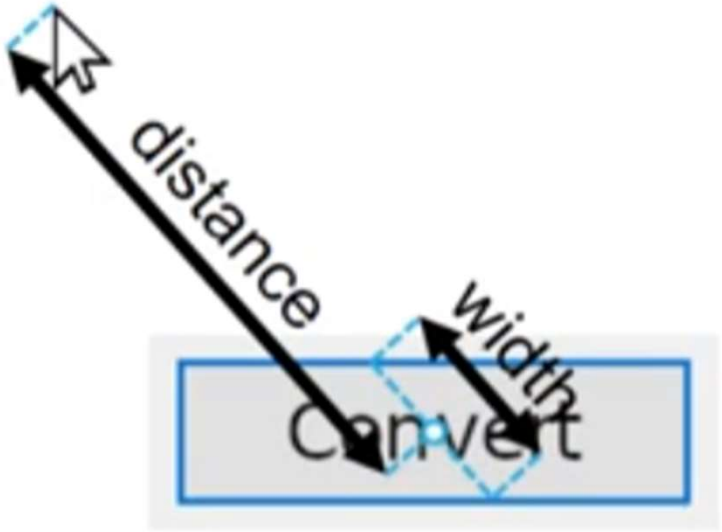
How about orientation of target

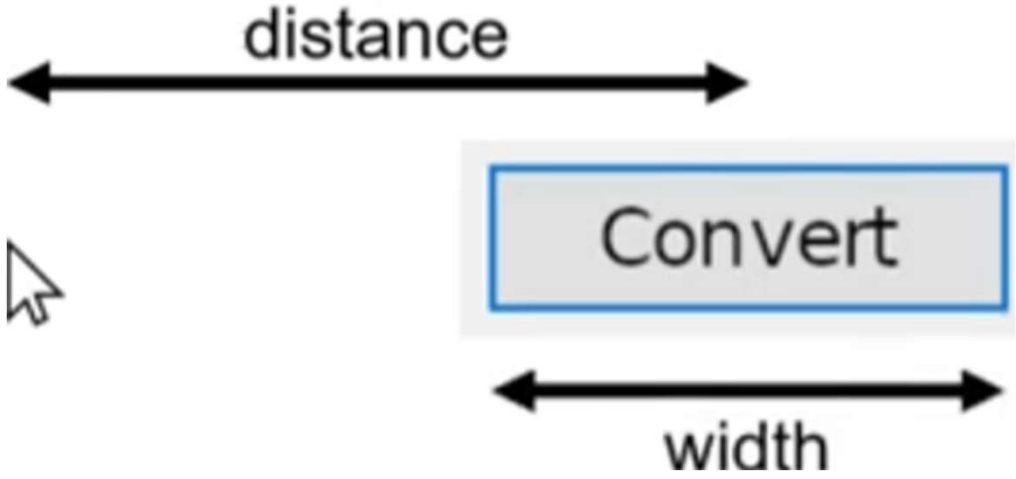



distance
width
Convert

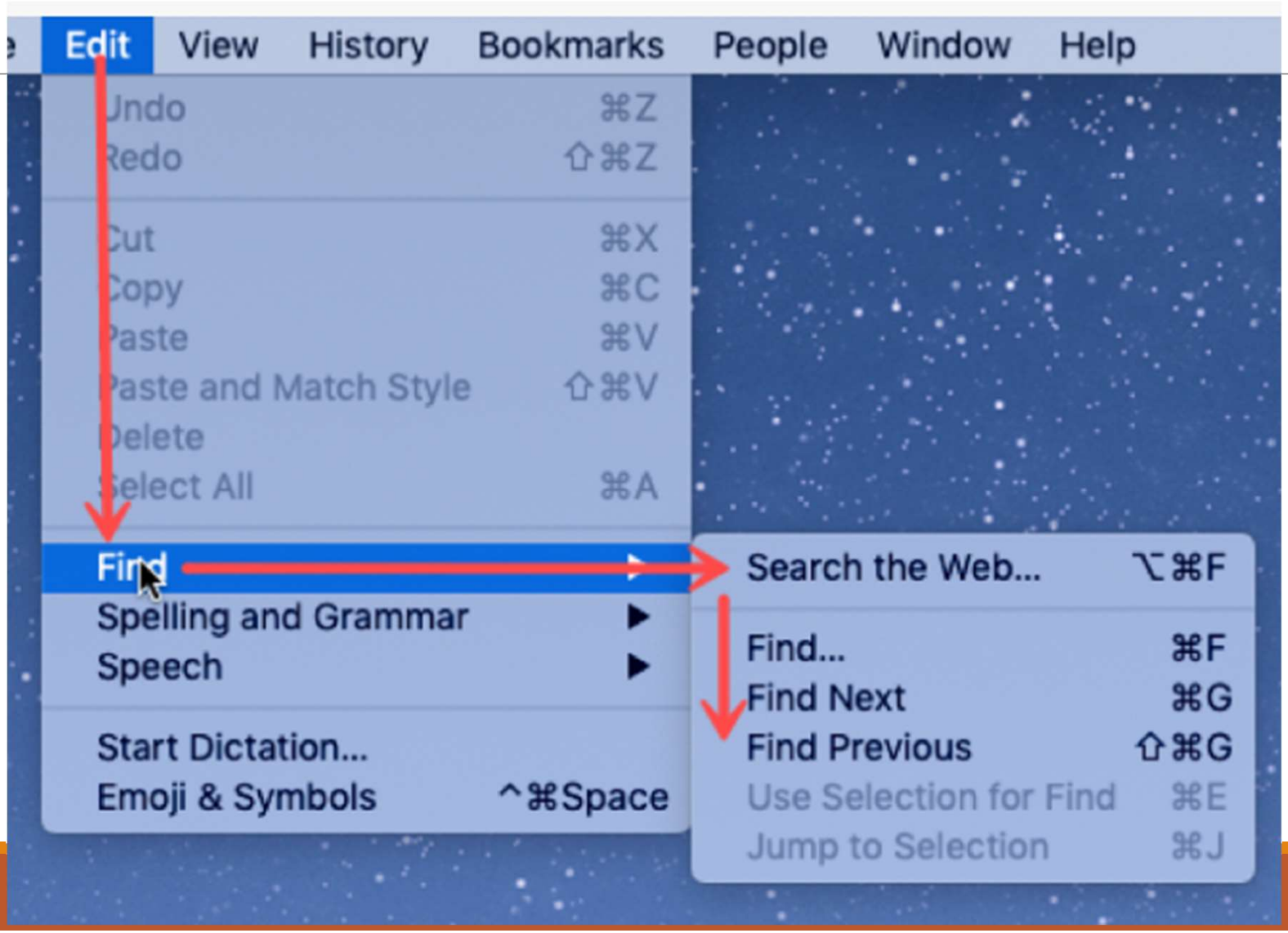
Throughput

- Throughput (TP) = Performance of a user with devices (e.g. Touchpad, Mouse) or alternative designs

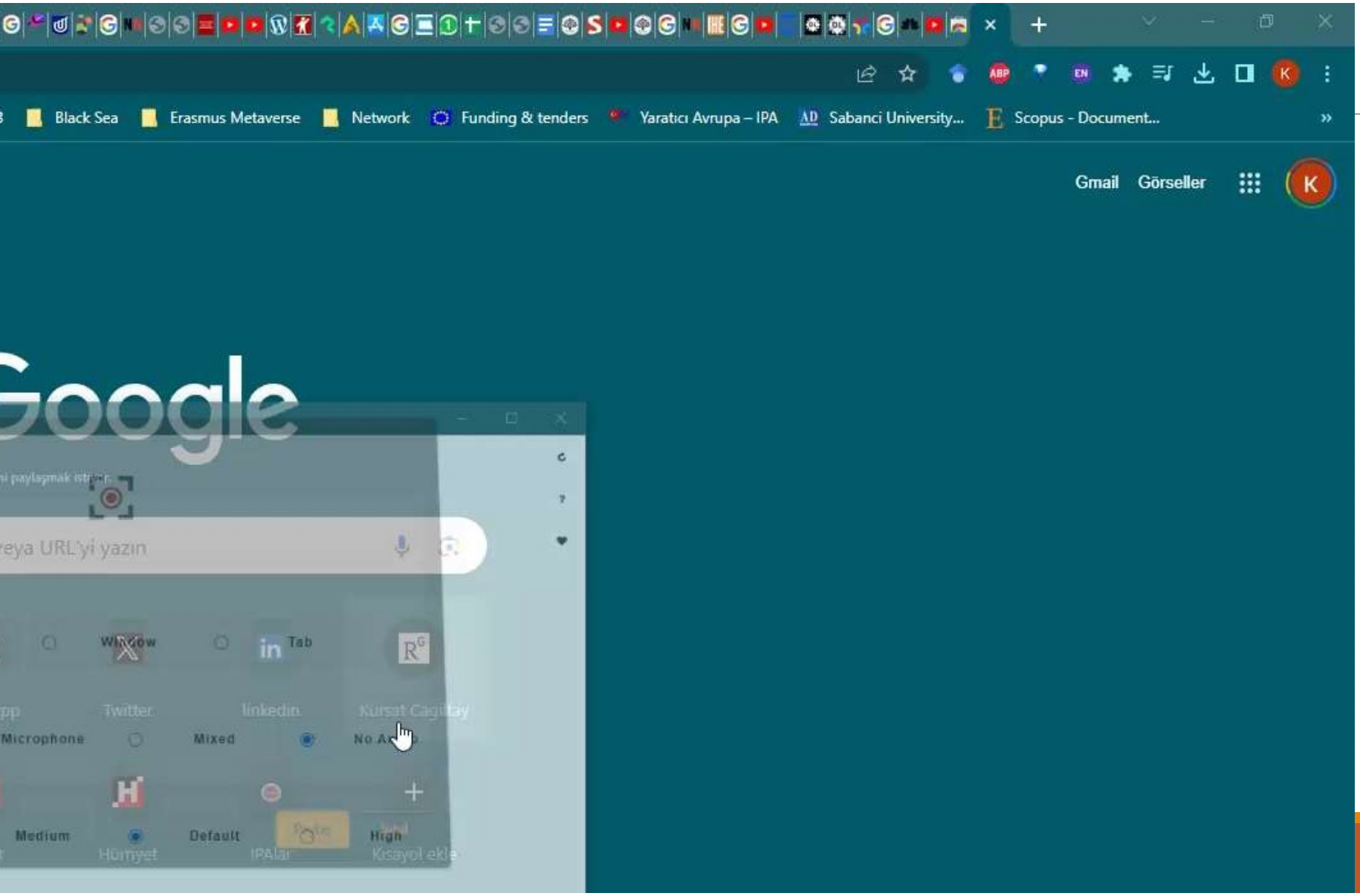




Steering through Tunnels Law
(Like a highway drive)

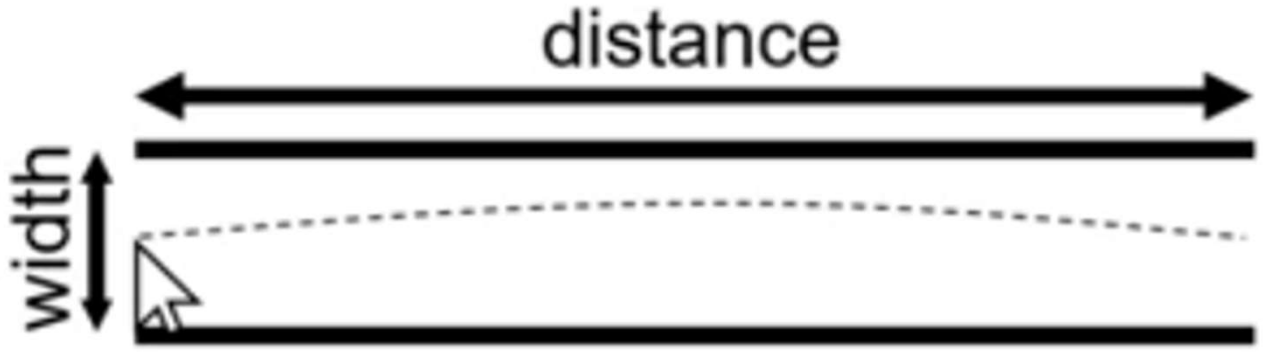


Steering through Tunnels Law

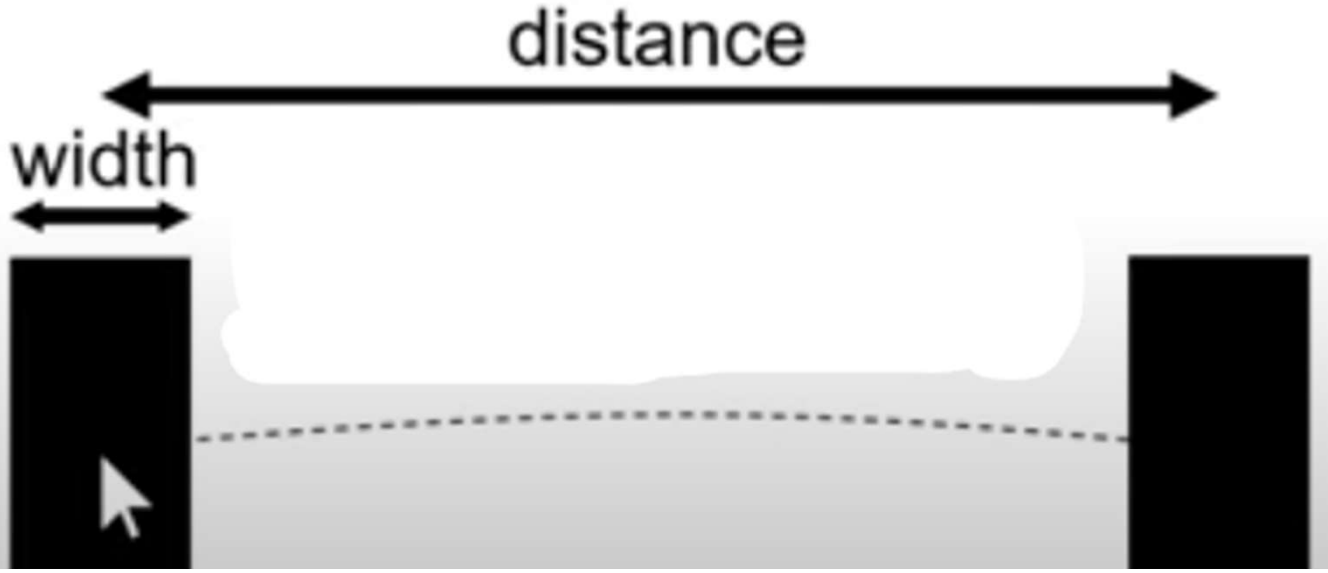


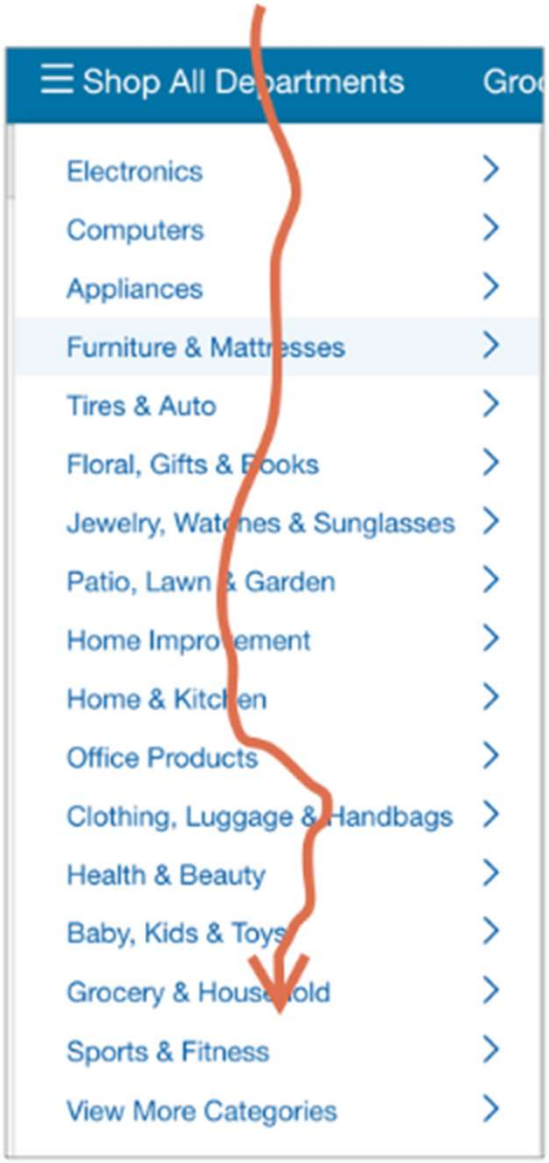
Steering through Tunnels Law

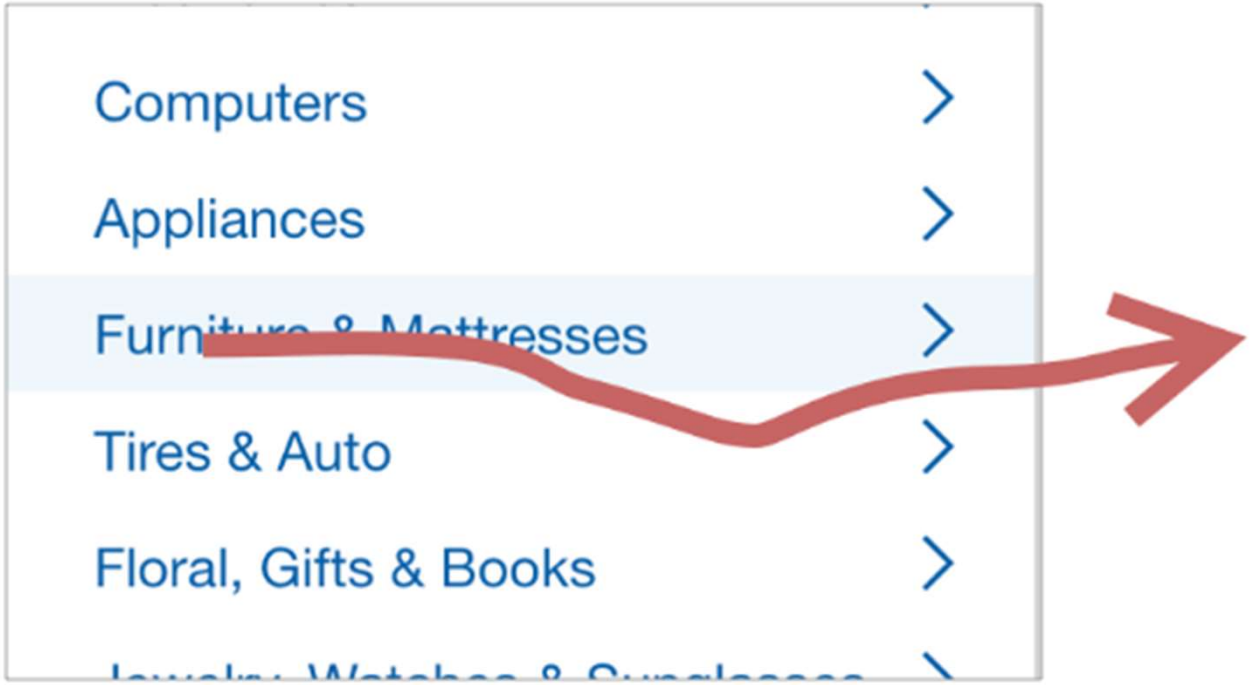
$MT = a + b\ (D / W)$



$MT = a + b\ Log_2\ (2D / W)$




Shop All Departments
Electronics
Computers
Appliances
Furniture & Mattresses
Tires & Auto
Floral, Gifts & Books
Jewelry, Watches & Sunglasses
Patio, Lawn & Garden
Home Improvement
Home & Kitchen
Office Products
Clothing, Luggage & Handbags
Health & Beauty
Baby, Kids & Toys
Grocery & Household
Sports & Fitness
View More Categories


Computers
Appliances
Furniture & Mattresses
Tires & Auto
Floral, Gifts & Books

Solution?

https://uxpickle.com/designing-an-effective-dropdown-menu-affordance/

Fish Eye Menu

Where did we use them?

- Turkish Army – Air Defense Command Control System

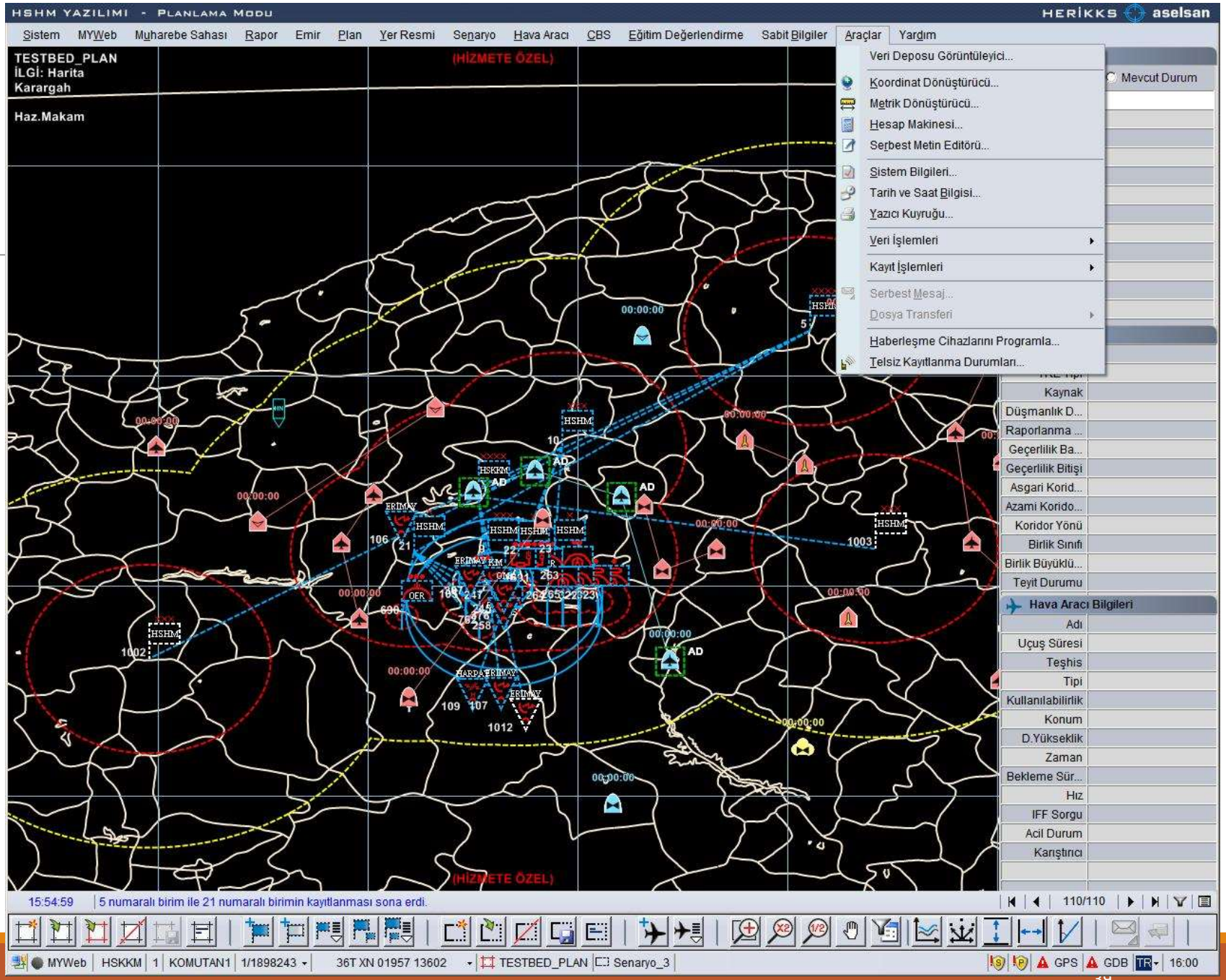
aselsan

HAVA SAVUNMA KOMUTA KONTROL YAZILIMLARI GRAFİKSEL KULLANICI ARAYÜZÜ TASARIM İYİLEŞTİRME PROJESİ

Mevcut Yazılımların Kullanıcı Arayüzlerinin Uzman Temelli Değerlendirilmesi

Proje Çıktısı Tasarım Önerileri Dokümanı

- No shortcuts
- Menu can only be used by mouse



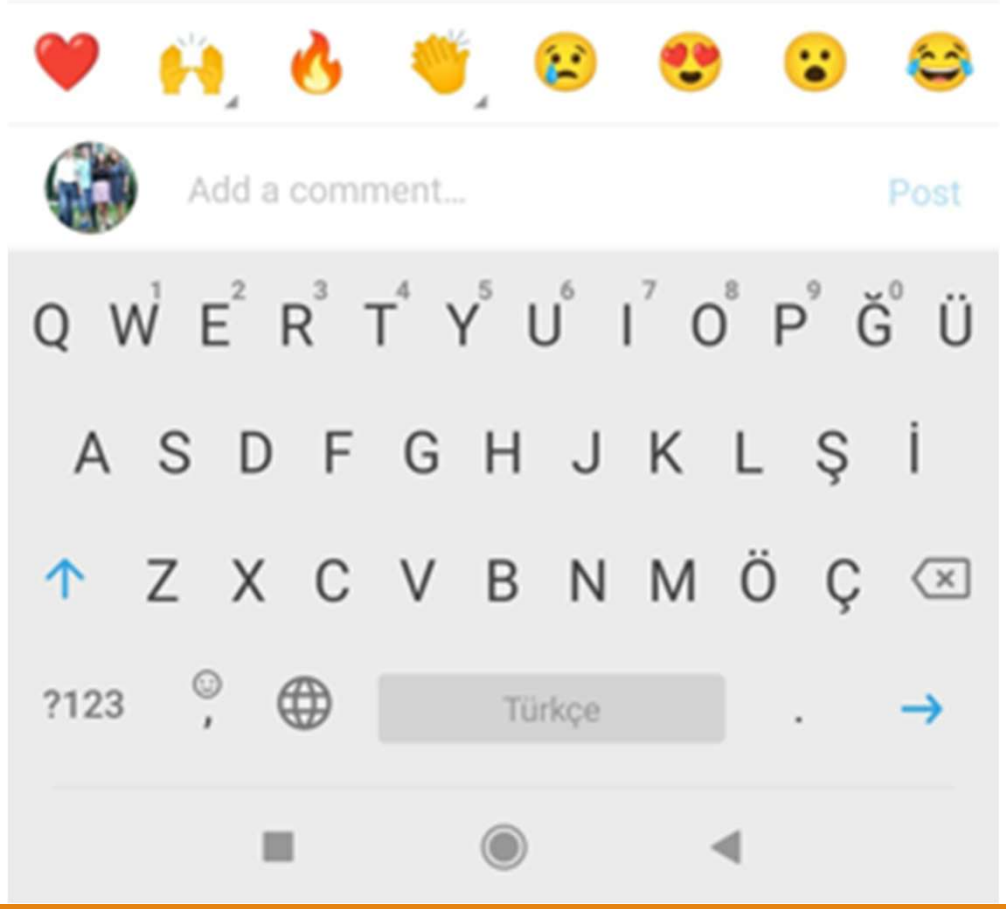
Case studies e.g.-

Gray et al (1992)

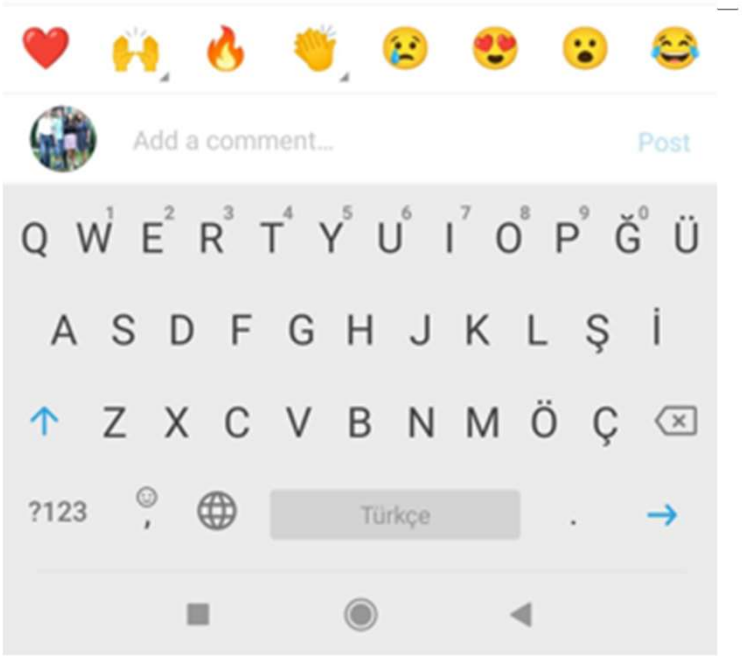
- NYNEX TAO operators and GOMS
- Compared existing with proposed system
- 1 sec delay in use costs $3million per year
- Real trial = 12 new systems installed for 6 months
- Analysts modeled existing performance from real data, and predicted performance on new system from specification

- Index of Difficulty?

Can you design an alternative keyboard for Turkish? What do you need?



You need a text corpus...



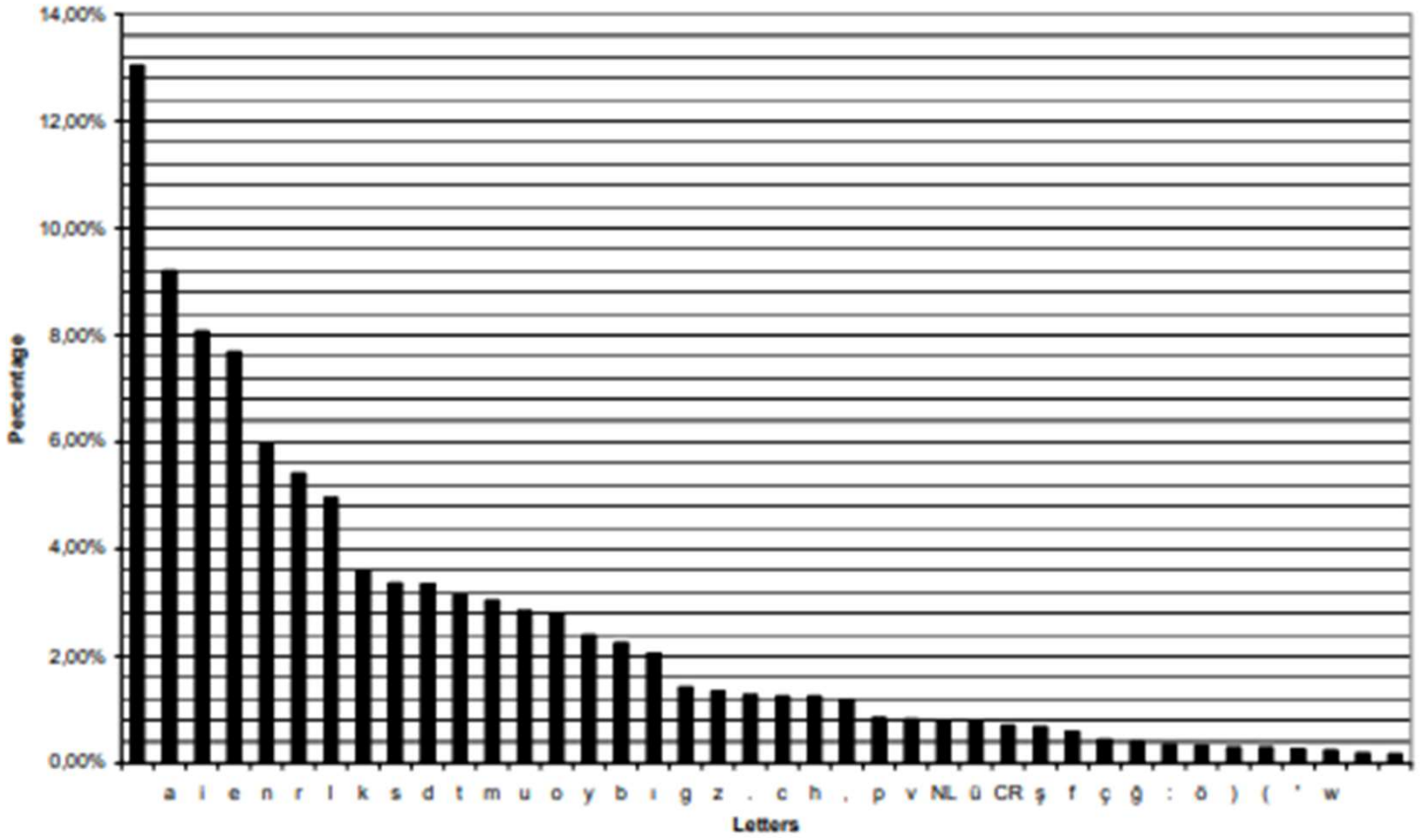
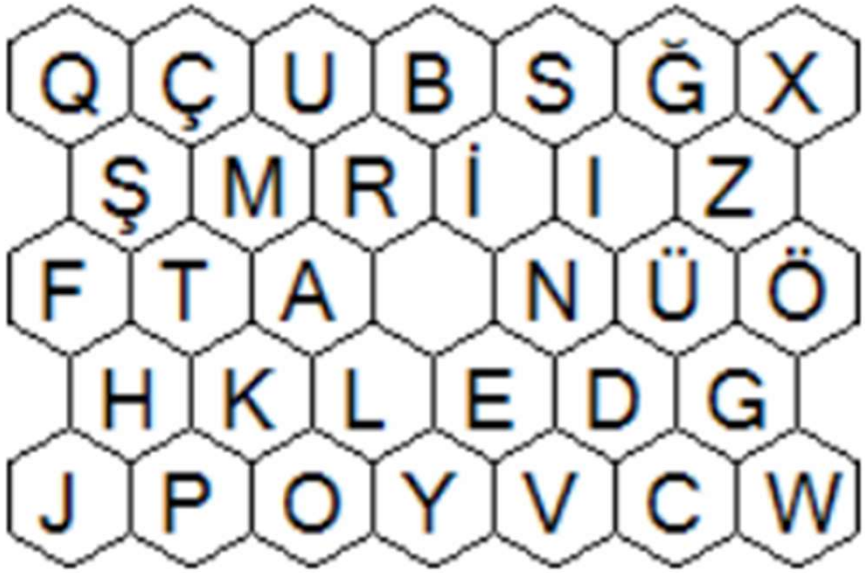


Figure 7 *ekSi sözlük* letter frequencies

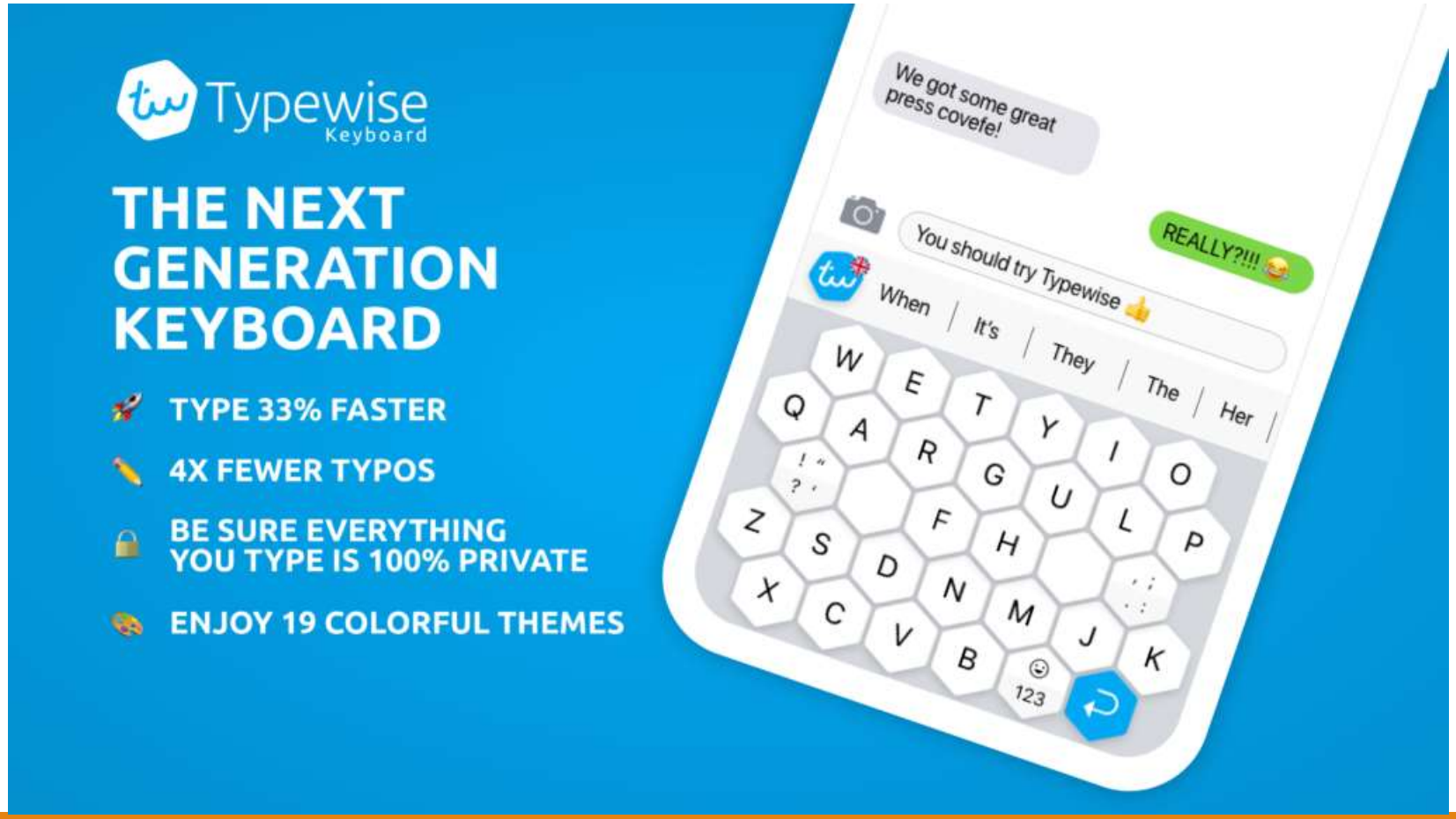
How about this? (2004)

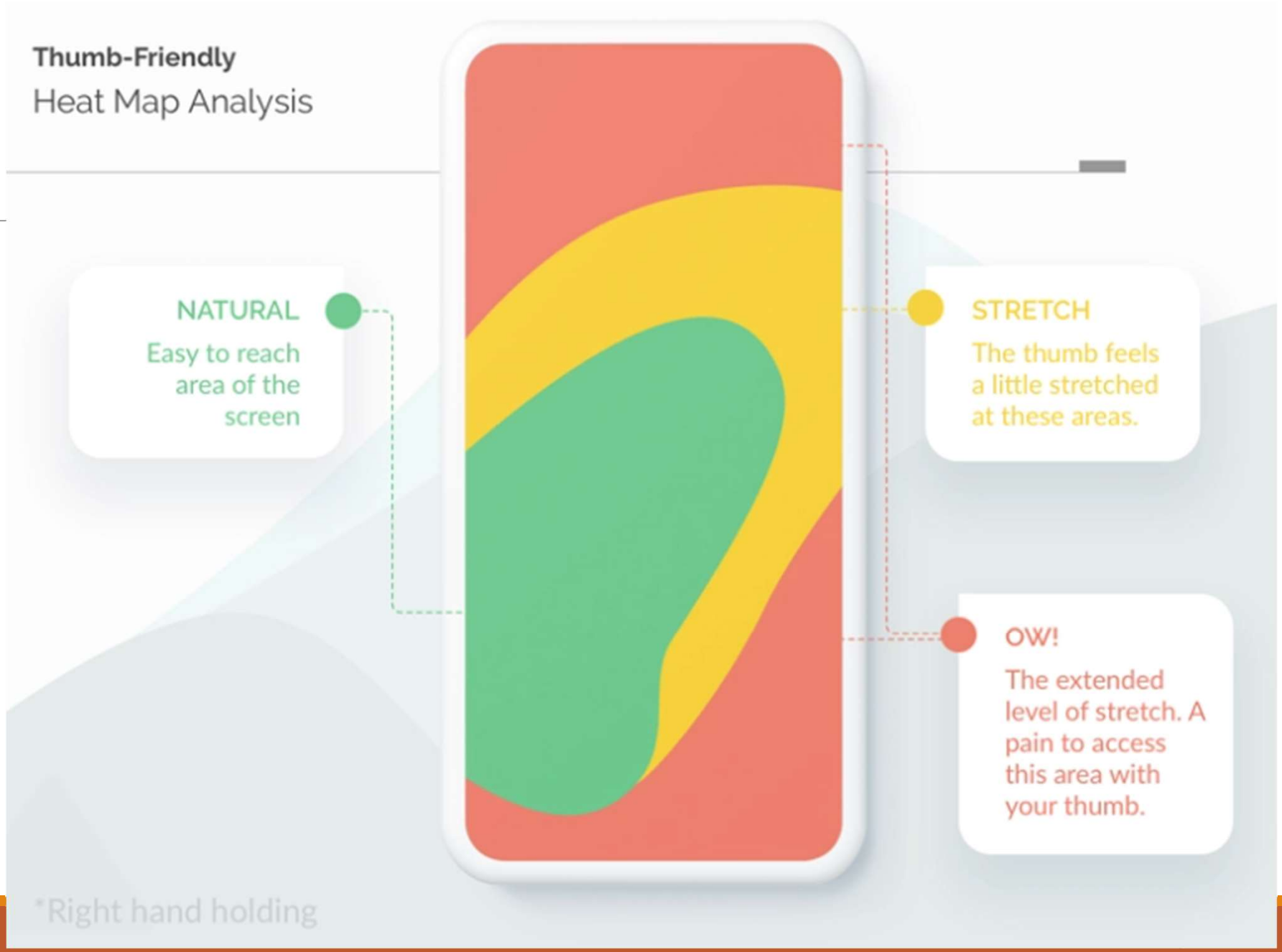


- Turkish Keyboard optimized by using Fitts's Law on Metropolis algorithm and KL heuristic
- 40.95 word per minute (wpm)

- Standard keyboard: 27.24 wpm
- Why don't we use it?

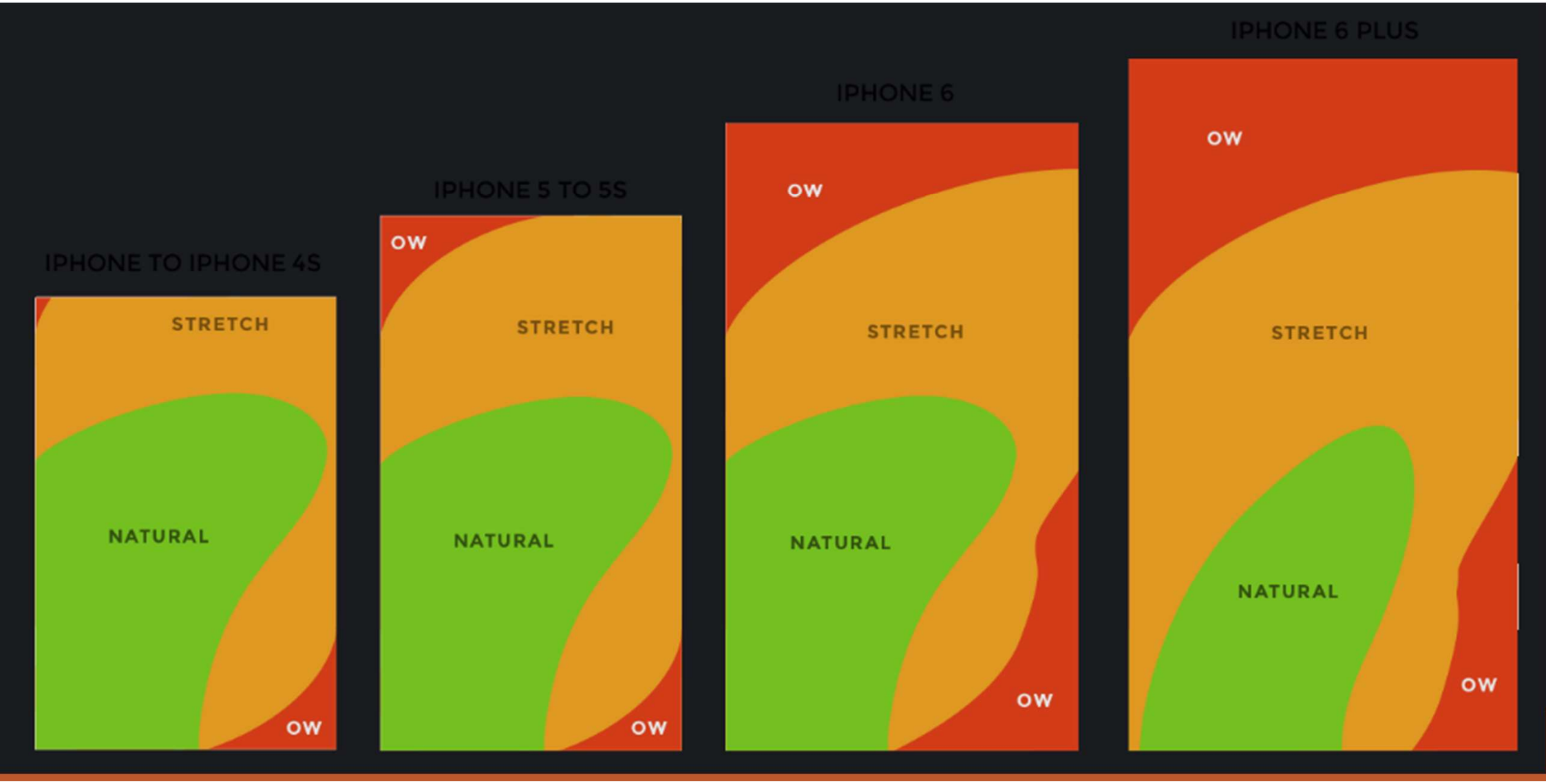
Today


Typewise
Keyboard
THE NEXT GENERATION KEYBOARD
TYPE 33% FASTER
4X FEWER TYPOS
BE SURE EVERYTHING YOU TYPE IS 100% PRIVATE
ENJOY 19 COLORFUL THEMES
We got some great press covefe!
REALLY?!!!
You should try Typewise
When
It's
They
The
Her

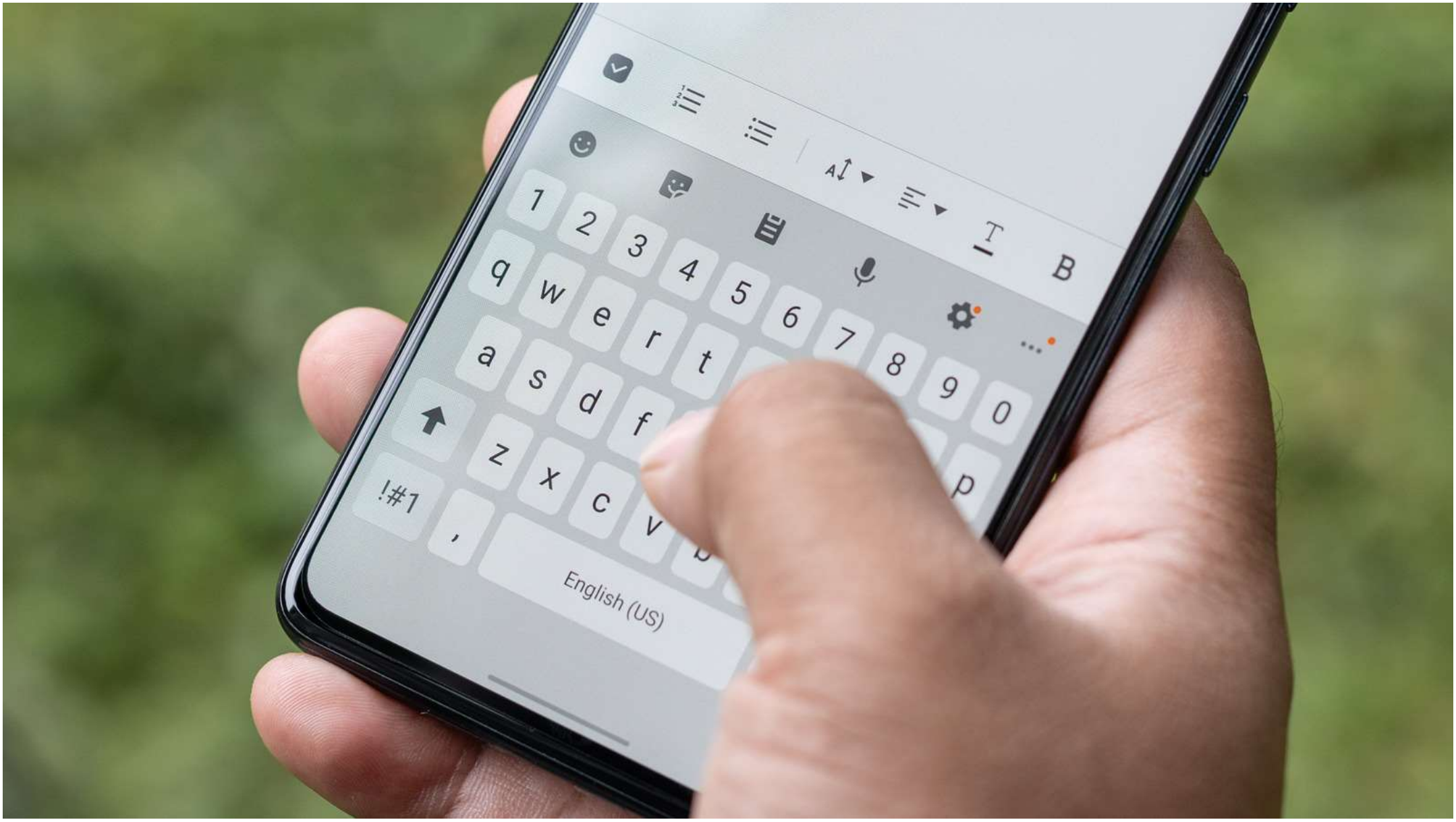

Thumb-Friendly
Heat Map Analysis
NATURAL
Easy to reach area of the screen
STRETCH
The thumb feels a little stretched at these areas.
OW!
The extended level of stretch. A pain to access this area with your thumb.
*Right hand holding


OW
STRETCH
NATURAL
OW

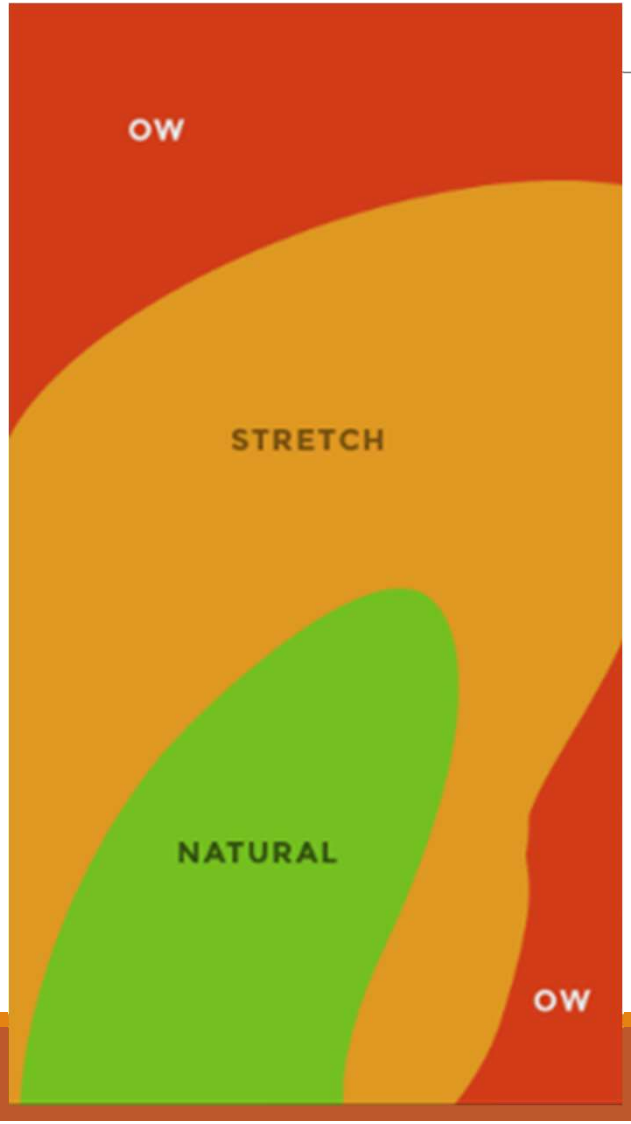
Thumb Zone heat maps for iPhones: ID is going up

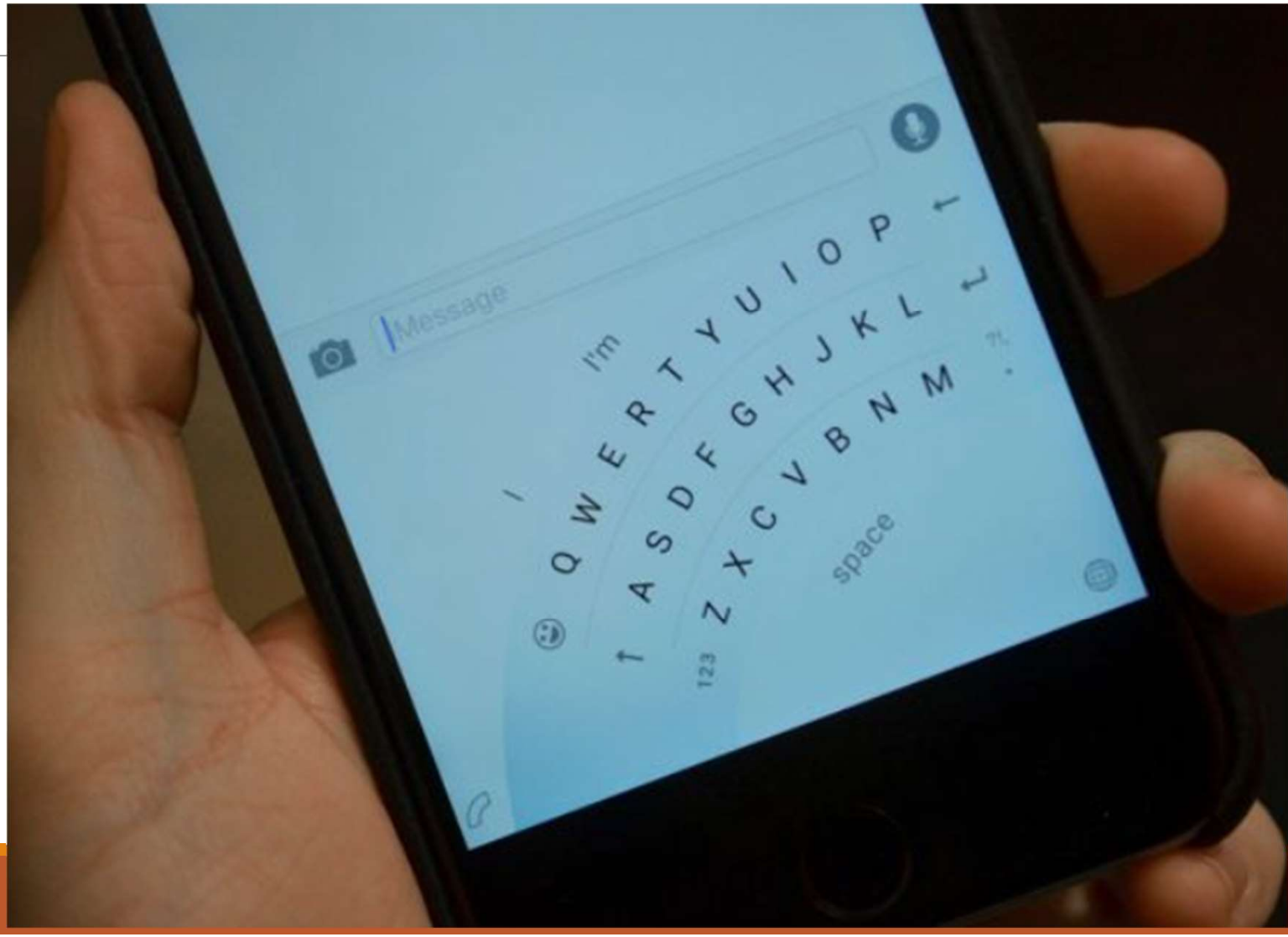



OW
STRETCH
NATURAL
OW
No!


1 2 3 4 5 6 7 8 9 0
q w e r t
a s d f
z x c v
!#1
,
English (US)
B

Microsoft’s curved keyboard



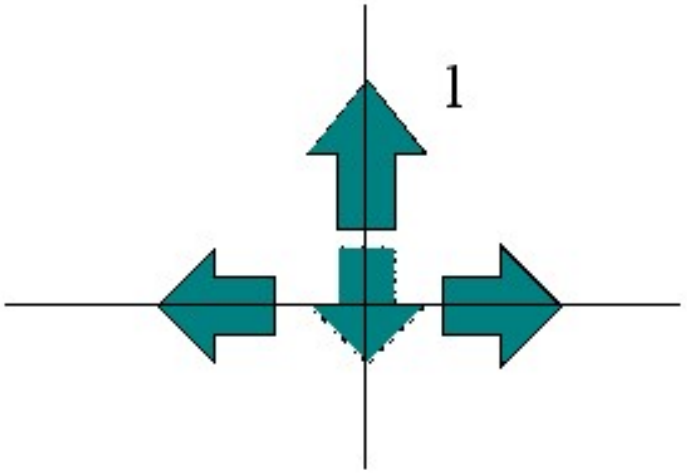


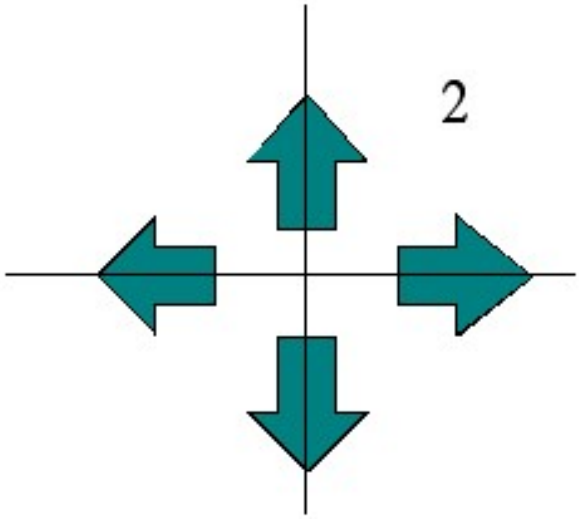
Usability of interactive systems:

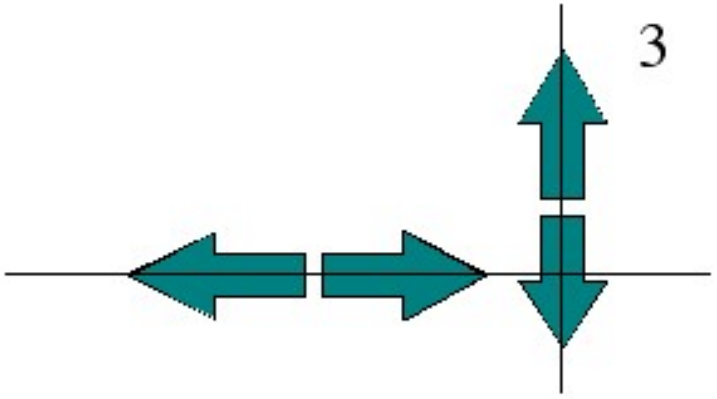
Ben Shneiderman. Ch-3 Guidelines, Principles, Theories

1. Style Guidelines,
   - Low-level focused advice about good practices
2. Principles,
   - Middle-level strategies or rules to analyze and compare design alternatives
3. Theories
   - High-level widely applicable frameworks

Which cursor key layout is best?







Why?

Empirical Approach

- Derives principles from evidence
- Manipulates interface variables experimentally and observes effects
- Seeks to derive laws of interaction
- Seeks to verify all claims for good design

- how to better design interfaces based on experimental findings (Shneiderman)

Reading from Screen or Paper?

- Typical screen reading is 20% slower than paper
- People read from screen readers complain fatigue
- Comprehension and navigation problems

- What is the cause? Does it change according to
  - Age?
  - Technology? Tablet vs Kindle vs Phone

- There is no significant difference between reading from paper versus tablet screen.

- But,

International Eastern Conference on Human-Computer Interaction (IECHCI2022) https://www.iechci.info/

Analyzing usability of screen and paper on reading: an eye tracking study

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***Abstract*—This study aims to examine whether misspelled types of text affect eye behavior while reading from paper and tablet screens. In addition, this study tests that participants tend to look at which sides of the print and screen while reading. The stimulus material that is used does not include any number, statistic symbol, or calculations. That is why Tobii X2-60 eye tracker device is used to record gaze movements. Tobii Studio Software 3.4.8 version is used to analyze gaze data and show findings in gaze plots and heat maps. The data were collected in laboratory settings. Participants were not informed about errors in stimulus material. The study aims to observe participants' gaze reflex and behavior whether realizing a misspelled word. In the experiment, participants read from paper and tablet respectively, which is Experiment.1 of this study.**

Keywords: Eye movement, Reading behavior, Misspelled words

Which One? How do we decide?

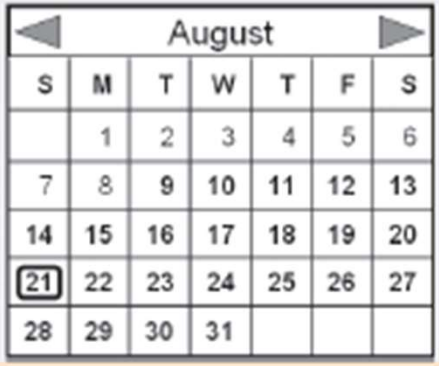
An example of progression toward more direct manipulation: less recall/more recognition, fewer keystrokes/fewer clicks, less capability to make errors, and more visible context.

a. Command line

b. Form fill-in to reduce typing

c. Improved form fill-in to clarify and reduce errors

d. Pull-down menus offer meaningful names and eliminate invalid values

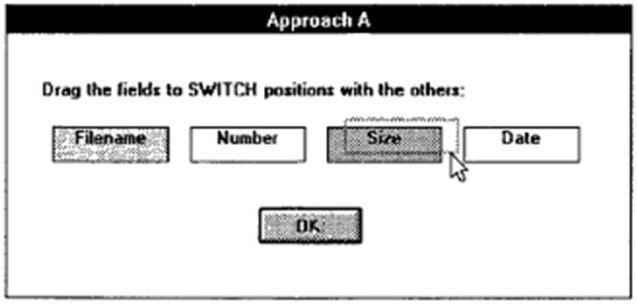


e. 2-D menus to provide context, show valid dates, and enable rapid single selection

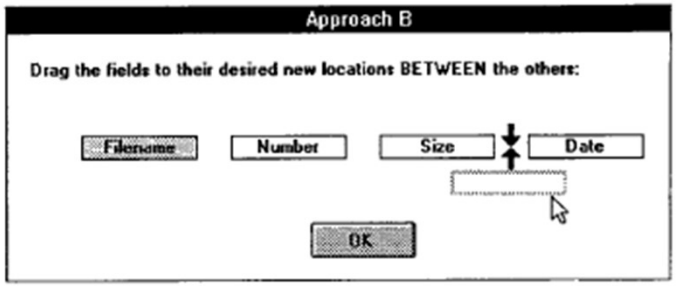
Comparison of data re-ordering feature

Tullis and Kodimer (1992)

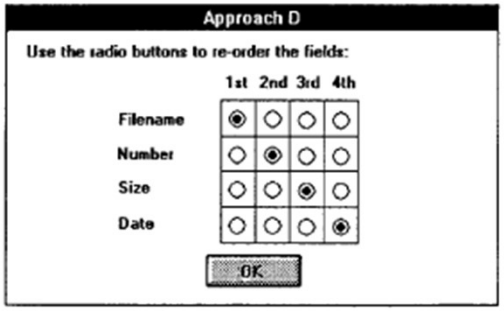
- Drag and drop
- Drag and drop between
- Icons
- Radio buttons
- Menus
- One entry area
- Four entry areas



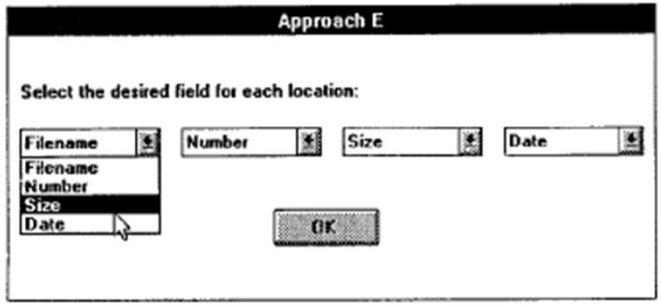
"Drag and Drop On" approach.



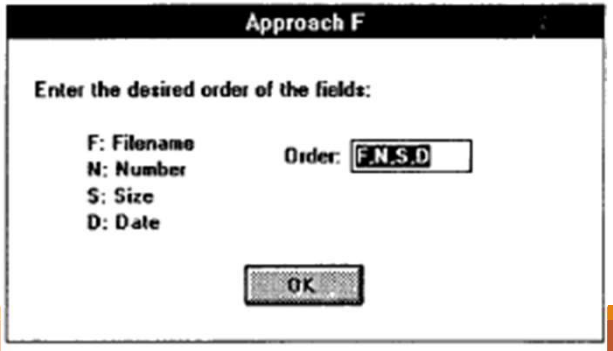
"Drag and Drop Between" approach.



"Radio Buttons" approach.



"Menus" approach.



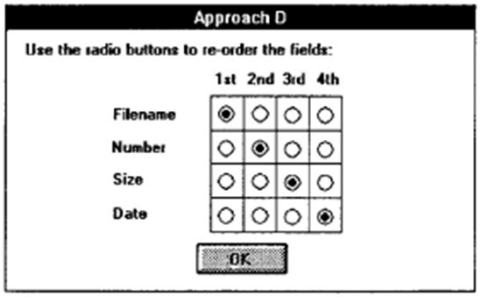
"One Entry Area" approach.

"Four Entry Areas" approach.

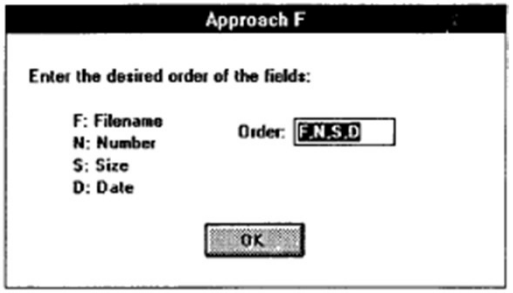
Method

- 15 users, 12 trials per method
- Changing either 2,3, or 4 fields of data
- Time and accuracy were recorded
- Experimenters determined minimal keystrokes/mouse event required
- User performance compared with prediction

Results



"Radio Buttons" approach.

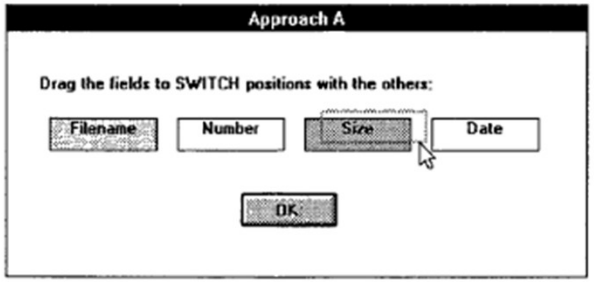


"One Entry Area" approach.

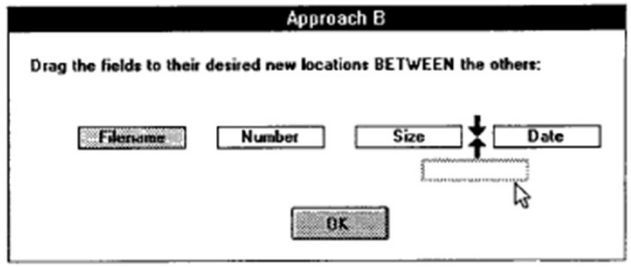
- «Radio buttons» and «One entry area» best
- «Four entry area» worst
- Differences appear when 3 or 4 fields are changed
- No correlation with keystroke/mouse acts
- User satisfaction positively correlated with data

"Four Entry Areas" approach.

Conclusion (p.270)



"Drag and Drop On" approach.



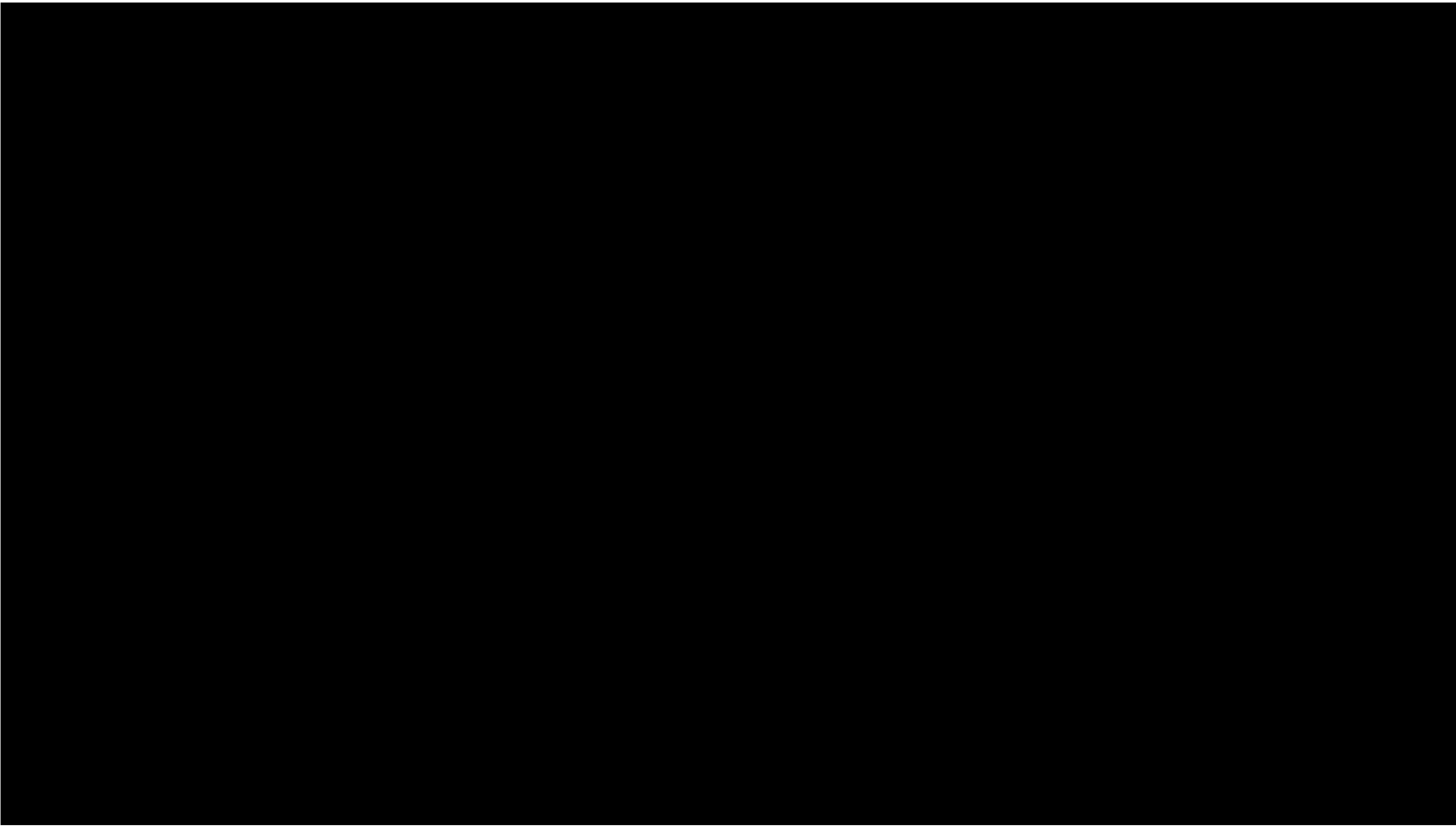
"Drag and Drop Between" approach.

- decisions based on guidelines, convention, and intuition **may not** always yield the most effective interface design
- dragging and dropping approaches studied here were **not** among the most effective user interfaces for this particular task.

- (This could be a nice Term paper – replicate the study!)

Affect / Emotions

Research



- Beautiful=Easy to use

- Very high correlations were found between perceived aesthetics of the interface and a priori perceived ease of use of the system

Aesthetics and Apparent Usability: Empirically Assessing Cultural and Methodological Issues

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"... it requires a somewhat mystical theory of aesthetics to find any necessary connection between beauty and function." (Herbert Read, Art and Industry, p.61).

ABSTRACT
Three experiments were conducted to validate and replicate, in a different cultural setting, the results of a study by Kurosu and Kashimura [12] concerning the relationships between users' perceptions of interface aesthetics and usability. The results support the basic findings by Kurosu and Kashimura. Very high correlations were found between perceived aesthetics of the interface and *a priori* perceived ease of use of the system. Differences of magnitude between correlations obtained in Japan and in Israel suggest the existence of cross-cultural differences, but these were not in the hypothesized direction.

perceptual capabilities and limitations has provided fertile ground for formulating principles (e.g., [22]) and guidelines (e.g., [28, 21]) of usable systems. Nielsen [21] defines the *usability* of a computer system in terms of five attributes: Learnability, efficiency, memorability, errors, and satisfaction. In general, the evaluation of system usability requires that these attributes be measured during or after people have actually used the system. Thus, while designers might rely on principles and guidelines to design usable systems, the use of certain inspection methods, if not extensive testing, is required to establish a certain degree of usability. On the other hand, evaluating other determinants of system acceptability may not require such a lengthy process. For example, system cost or likeability can be evaluated relatively simply and quickly. Thus, much effort might be invested by HCI designers in their attempts to evaluate and improve usability whereas, at the same time, other

- degree of system's aesthetics affected the post-use perceptions of both aesthetics and usability

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What is beautiful is usable

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Received 10 January 1999; revised 2 March 2000; accepted 24 March 2000

Abstract

An experiment was conducted to test the relationships between users' perceptions of a computerized system's beauty and usability. The experiment used a computerized application as a surrogate for an Automated Teller Machine (ATM). Perceptions were elicited before and after the participants used the system. Pre-experimental measures indicate strong correlations between system's perceived aesthetics and perceived usability. Post-experimental measures indicated that the strong correlation remained intact. A multivariate analysis of covariance revealed that the degree of system's aesthetics affected the post-use perceptions of both aesthetics and usability, whereas the degree of actual usability had no such effect. The results resemble those found by social psychologists regarding the effect of physical attractiveness on the valuation of other personality attributes. The findings stress the importance of studying the aesthetic aspect of human–computer interaction (HCI) design and its relationships to other design dimensions.

Keywords: User interface; Aesthetics; Usability; Apparent usability; HCI design considerations; HCI perceptions

- visually appealing websites rated more secure
- enter sensitive information into visually appealing websites—
- users rely on visual appeal when making security and trust decisions on websites

Recent Study

ACM Transactions on Privacy and Security

What is Beautiful is Secure

MILICA STOJMENOVIĆ and ERIC SPERO, Carleton University, Canada
MILOŠ STOJMENOVIĆ, Singidunum University, Serbia
ROBERT BIDDLE, Carleton University, Canada

Visual appeal has been shown to influence perceptions of usability and credibility, and we hypothesize that something similar is happening with user judgments of website security: *What is beautiful is secure.* Web certificates provide reliable information about a website's level of security, presented in browser interfaces. Users should use this to inform their trust decisions online, but evidence from laboratory studies and real-world usage suggests that they do not. We conducted two studies—one in lab, and one online—in which participants view and interact with websites with high and low visual appeal, and various security levels, and then make security-related judgments. In both studies, participants consistently rated visually appealing websites as more secure, and indicated they would be more likely to enter sensitive information into visually appealing websites—even when they were less secure. Our results provide evidence that users rely on visual appeal when making security and trust decisions on websites. We discuss how these results may be used to help users.

- A longer study

- Before use
- After use

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Understanding user preferences based on usability and aesthetics before and after actual use

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Aesthetics
Perceived usability
Perceived aesthetics
Actual use

ABSTRACT

Designing a highly preferred product or system is a crucial issue for better information-services and product sales. We attempted to understand the process of users' preference-making based on usability and aesthetics. In the present study, we examined the relationships among usability/aesthetics features, perceived usability/aesthetics, and user preference through an experiment using four simulated systems with different levels of usability and aesthetics. The results showed that, before actual use, user preference was significantly affected by the differences in aesthetics but marginally affected by the differences in usability. On the other hand, after actual use, user preference was significantly influenced by the differences in both usability and aesthetics. Regardless of the occurrence of actual use, user preference was highly correlated with both perceived usability and perceived aesthetics, which were strongly interrelated. Finally, actual use had a significant effect on perceived usability, perceived aesthetics, and user preference. The findings emphasize the importance of considering both perceived usability and perceived aesthetics. They also demonstrate the need for discriminating users' interactions before and after actual use, in developing a more preferable computer-based application.

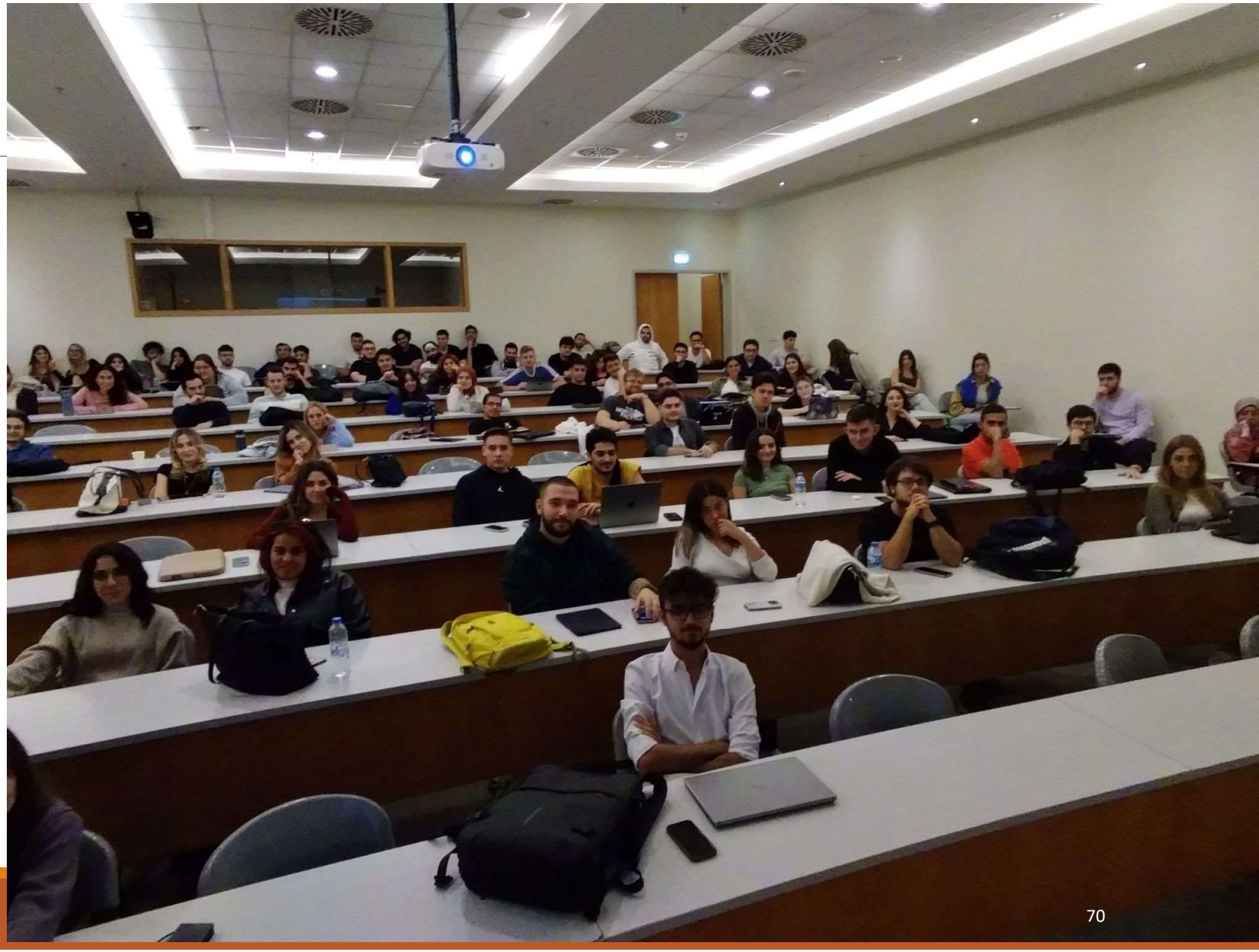
Before actual use User preference	**significantly** affected by the **aesthetics**	**marginally** affected by the usability factor
After actual use User preference	**significantly** influenced by both the usability and the aesthetics factors	
Before and after actual use	strong interrelationship between perceived usability and perceived aesthetics	

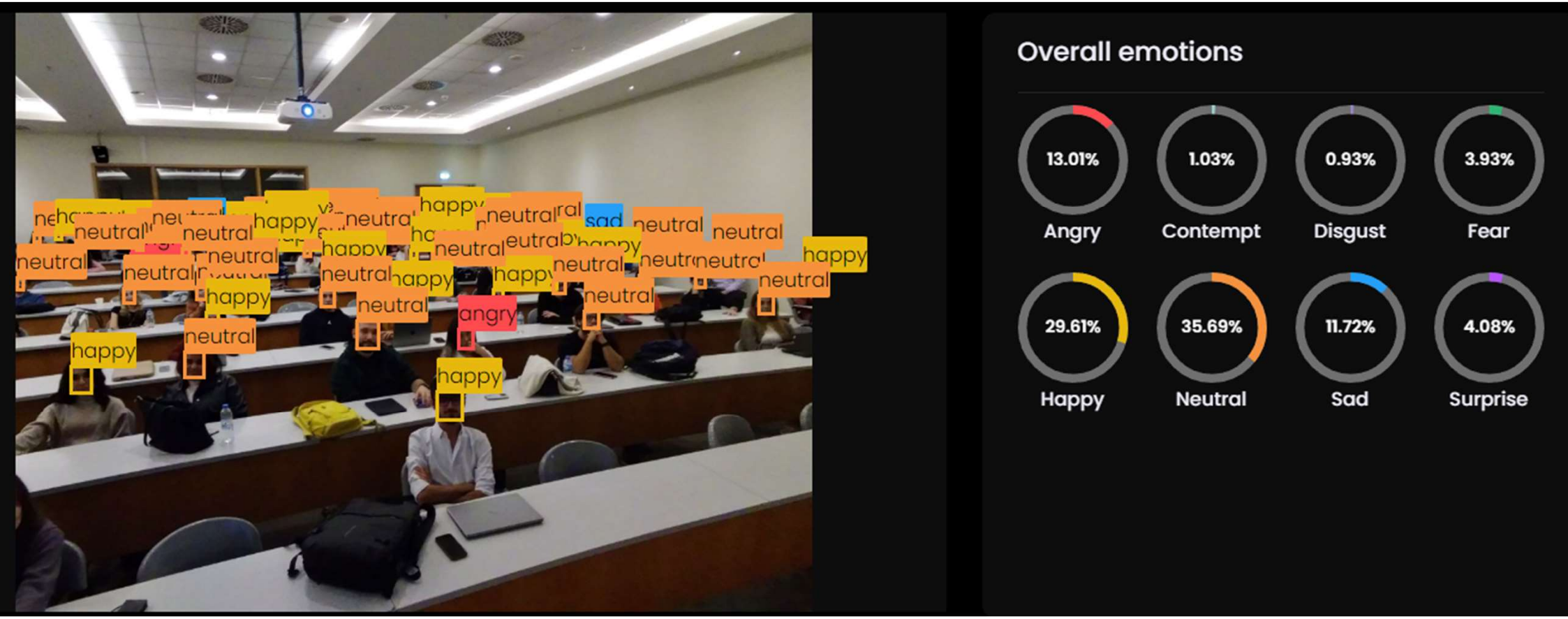
So

- Users respond to interface beauty
- Users do not predict their own performance (process and outcome) accurately
- Designers cannot usefully predict user response through introspection, any current theory of interaction, or asking their colleagues!

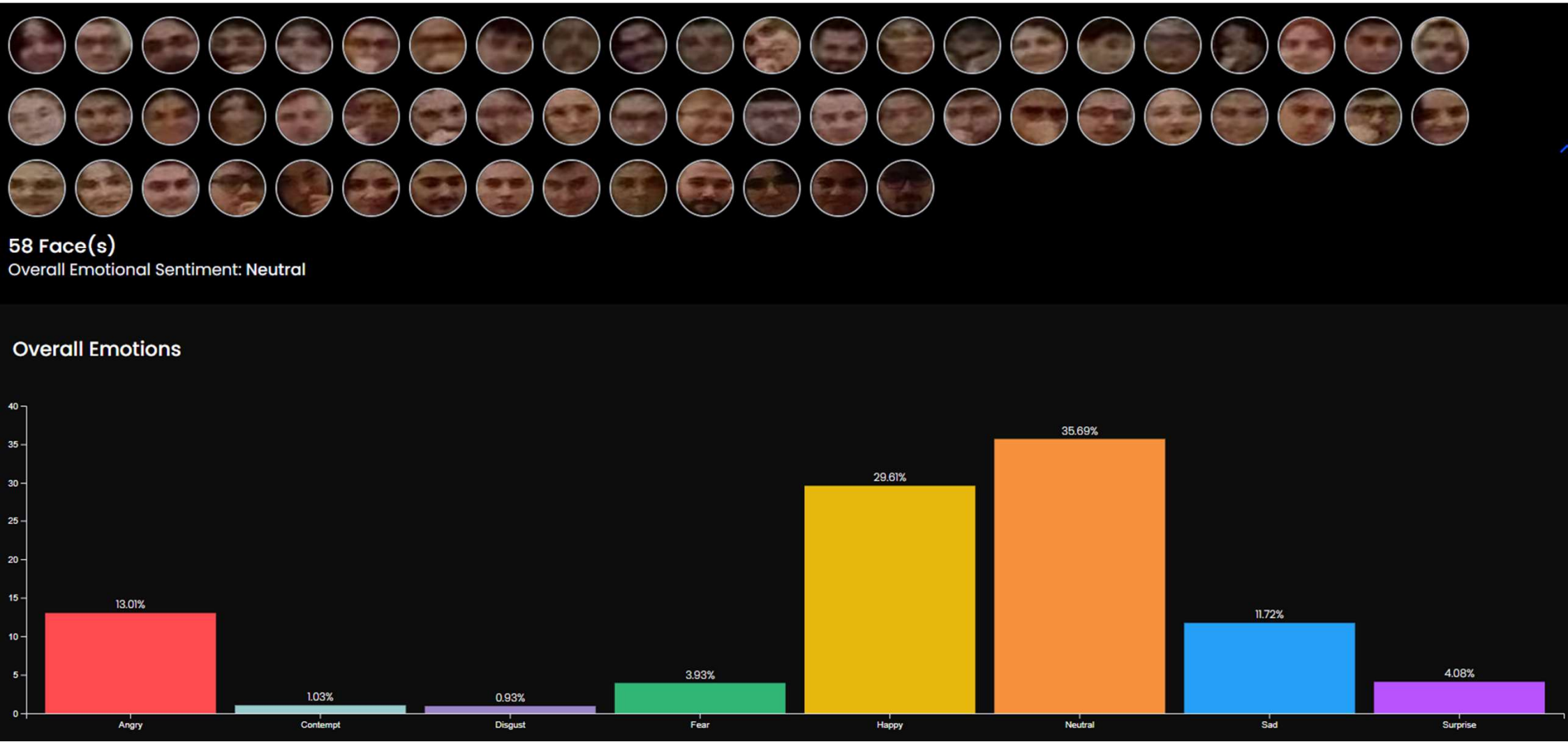
- Does apparent usability correlate with experience in use («true» usability)?

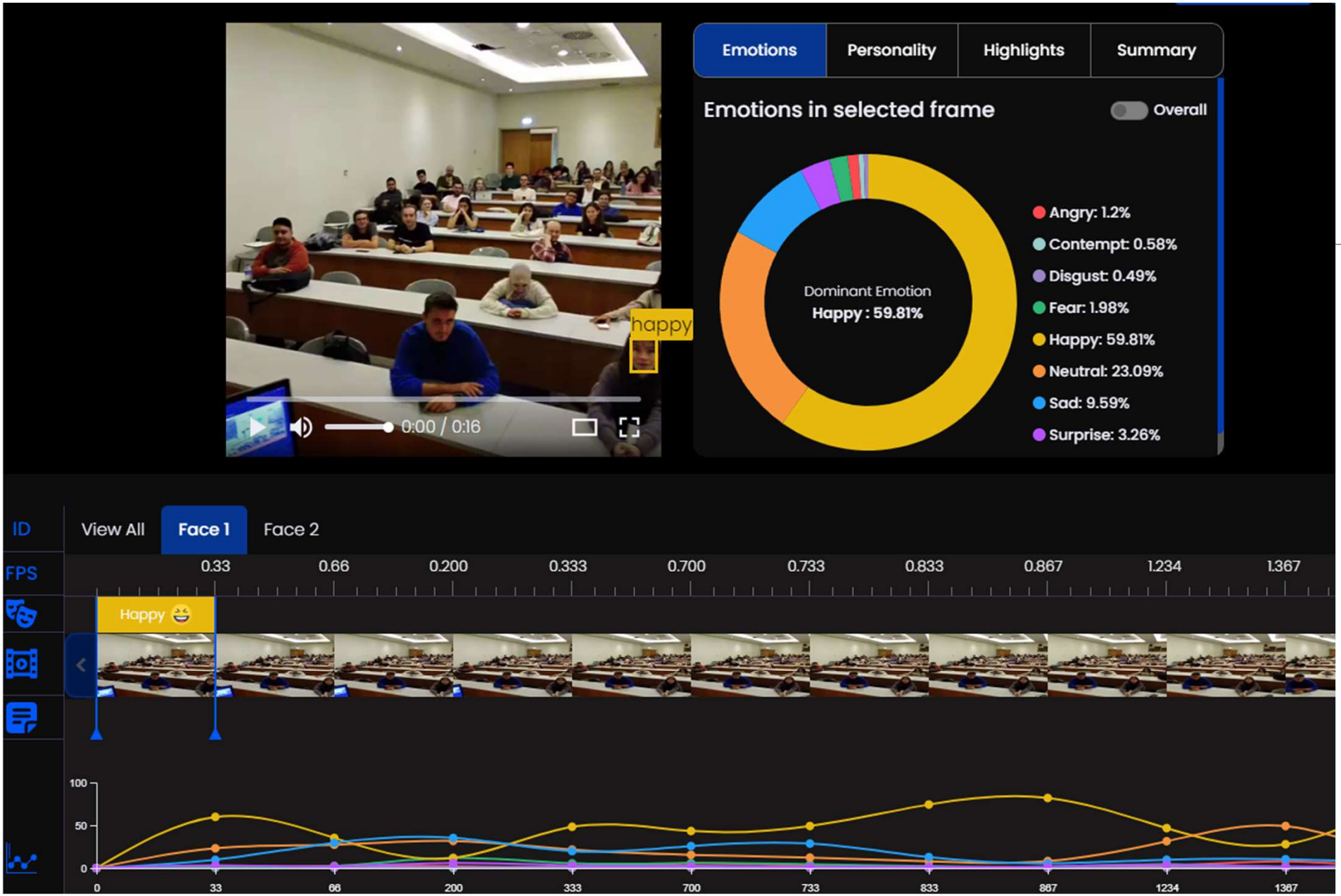
Affect in Classroom

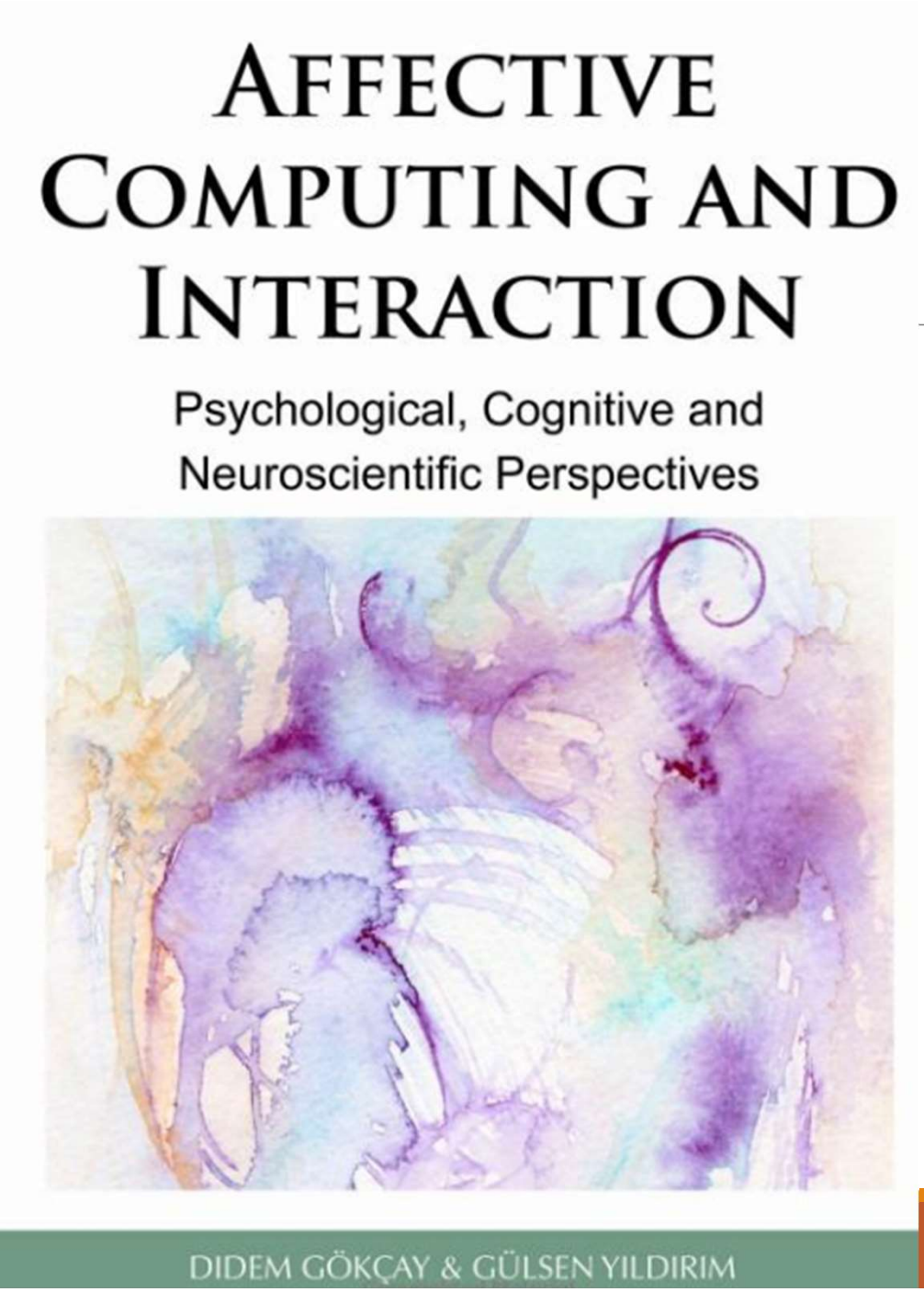




Emotion AI - Visual Sentiment Analysis


58 Face(s)
Overall Emotional Sentiment: Neutral
Overall Emotions
40
35
30
25
20
15
10
5
0
13.01%
1.03%
0.93%
3.93%
29.61%
35.69%
11.72%
4.08%
Angry
Contempt
Disgust
Fear
Happy
Neutral
Sad
Surprise


Emotions
Personality
Highlights
Summary
Emotions in selected frame
Overall
Dominant Emotion
Happy : 59.81%
Angry: 1.2%
Contempt: 0.58%
Disgust: 0.49%
Fear: 1.98%
Happy: 59.81%
Neutral: 23.09%
Sad: 9.59%
Surprise: 3.26%
happy
0:00 / 0:16
ID
View All
Face 1
Face 2
FPS
0.33
0.66
0.200
0.333
0.700
0.733
0.833
0.867
1.234
1.367
Happy
100
50
0
0
33
66
200
333
700
733
833
867
1234
1367



Chapter 14

Bringing Affect to Human Computer Interaction

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Pennsylvania State University, USA

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Middle East Technical University, Turkey

Kürşat Çağıltay
Middle East Technical University, Turkey

For full text book
https://ocw.metu.edu.tr/course/view.php?id=230

Term Project/Paper

- Empirical/Experimental report
- Generate data, Quantitative/Qualitative– examine the world
- Suitable methodology
- Group work – Suggested group size 3 people
- HCI relevant topic
  - Get my approval before you start working on it
  - Set as early as possible

Sample Term Project Topics

- Effectiveness of a new interaction method – e.g. gestures
- Design and test of menu styles – e.g. Fish eye vs hierarchical
- Redesign and test of Sabancı Univ. Web sites
- E-government, E-business, e-health usability
- SW Engineering methodologies and usability
- Comparision of online banking/shopping systems
- Mobile interactivity (e.g. MySU mobile)
- Children/Elderly, blind/deaf users
- Security vs. Usability (e.g. Two-factor authentication)
- VR, AR studies
- Computer games

Some Previous Term Projects

1. Design and Test of a magnifier application for VR
2. Comparison of cognitive modeling and user performance analysis for touch screen mobile interface design
3. The effect of apologetic error messages users' performance
4. Evaluation of Inputting text methods in RPG for player performance
5. Usability tests (shopping sites, banking services, municipalities, etc.)
6. Design/Test of Mobile application for individuals with intellectual disabilities
7. The role of visual coherence in graphical passwords
8. User study on generative AI technologies (ChatGPT)
9. Developing a Gesture-Based Game to Teach Basic Life Skills
10. Usability comparision of two-factor authentication
11. Multimodal comprehension of language and graphics: Graphs with and without annotations
12. The Influence of a Trolling Game on Perception of Toxic Behavior
13. Usability and Design Aspects of Large Multitouch Interfaces